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## NOTES FOR SHEEP-FARMERS.

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WHILE New Zealand is remarkably free from sheep-diseases of a contagious nature, sheepowners still have to contend with trouble in the shape of sickness and mortality due to other causes. Most of this is the result of sheep and lambs living under what are really conditions too good for their physical well-being, nature having so fashioned the system of the sheep as to render it an animal capable of remaining strong and healthy under adverse climatic and feeding conditions, such as are brought about by cold winters with accompanying shortness of feed, necessitating free and constant movement in order to obtain the nourishment necessary for the proper maintenance of health. A good illustration of this is furnished by the fact that

this season, as has been the case regularly in previous years, such troubles as ante-partum paralysis of ewes and ante-partum extrusion of the vagina (described in Veterinary Bulletin No. 15, by Dr. Gilruth, issued by the Department) have taken their annual toll in districts where ewes have been so "well done by" during the winter as to come towards their lambing in too high condition; whereas in the higher land of the South Island, with its more inclement climate, these troubles are seldom if ever heard of.

It is all a question of management. Farmers naturally keep sheep for the purpose of making money out of them, and the most successful man is he who realizes how far he can go in the direction of doing his ewes well without overstepping the danger-mark and allowing them to pile on fat to too great an extent prior to lambing. It must be realized that a ewe which is carrying too much fat is physically weaker in every way and less likely to rear a profitable lamb than is one which is simply in good healthy condition. It is right enough to give the ewes plenty of good feed when they are suckling their lambs, but it is risky to do them too well during the last two months before lambing. I have said or written all this before, but there is evident good reason for repeating it.

### ACUTE CONGESTION OF THE KIDNEYS IN LAMBS.

Following on the above general remarks regarding ewe troubles, attention must be called to the mortality which occurs every season among lambs — chiefly in the North Island, where feeding and climatic conditions are most kindly to the ewes and lambs. This affection is purely one brought about by overnutrition. It is almost invariably those single lambs in the highest and best condition that are affected. Twins, having to share the milk of their dam, run less risk of overnutrition and usually escape trouble. Dr. Gilruth, to whom New Zealand owes much for his investigation work in connection with sheep-diseases, wrote very fully upon this trouble in the annual report of the Department for 1907. The sound opinions he formed then have not been shaken by later experience, and the extracts from his report which follow, and which comprise the facts of the matter from the farmer's point of view, are well worthy of reproduction at the present time. His opinions were as follows:—

As regards symptoms, there are none of a premonitory nature. Usually the lamb, strong in build, fat in condition, usually a "single" lamb and about a month old, is found dead, lying in a more or less natural attitude. Death generally occurs suddenly — often while playing. Occasionally some form of giddiness may be observed for a few minutes before death, but nothing more definite.

If the internal organs be examined immediately after death they will appear practically normal to the casual observer. There is a good deal of fat beneath the skin and in the abdominal cavity. The functions of the rumen (paunch) have just begun to be employed, as is evidenced by the fact of grass being present in it. The age is constantly from about four to eight weeks. The fourth stomach contains curdled milk, which, although only to be expected, seeing that the animal will have fed only recently, is frequently and erroneously deemed by the shepherd to be the cause of death. Almost with equal constancy may be found among the contents of the fourth stomach a loose ball of wool, or of wool and grass, to the presence of which death is almost generally attributed. As such a collection of wool is almost invariably found in any lamb's stomach, it having gradually accumulated through strands of wool being swallowed accidentally in the process of sucking the mother's teats, and as it never, in my experience, is in such a situation as to cause interruption to the passage of ingesta onwards from the stomach, and as there is never any evidence whatever of gastritis, its presence is totally without significance from a pathogenic point of view.

The kidneys are the only constant seat of disease, and in a casual post-mortem examination they are easily overlooked. They are bulky, dark-coloured, and are often so soft and extremely pulpy that they cannot be removed in a complete condition, and frequently have the capsule enclosing them ruptured in handling, and only a dark pulpy mass may be secured. The kidneys generally appear enlarged. On removing the capsule of the kidney the tissue beneath has almost the appearance of a blood-clot, due to congestion and the enormous hæmorrhage which has occurred in the substance of the organ. The liver is also generally congested. The heart is frequently distended, and the pericardium (the membrane enclosing the heart) usually contains clear gelatinous fluid, varying in quantity from 2 to 4 fluid ounces.

It is difficult to state exactly what is the exciting cause of this congestion of the kidneys and liver, but the predisposing causes are very evident. They are as follows: The age of the animal—that is, the time when the milk of the mother has begun to be supplemented by herbage—rich and plentiful supply of mother's milk, the absence of another lamb to diminish the excessive supply of mother's milk, and good pasture, favouring the production of this rich and plentiful supply of milk. In other words, all that tends to induce a plethoric condition in the lamb at the age of from four to eight weeks, before it has begun to take exercise far afield from the mother, predisposes to this disease. That this is so is proved by the fact that the best and surest preventive measure to adopt is the docking of the tail when the lamb is about three weeks old. After castration the disease rarely or never appears in ram lambs, whereas in ewe lambs, especially those docked when about a week or ten days old, it may appear later. This means simply that ample bleeding, by reducing the plethoric condition of the animal, removes the primary predisposing cause of this disease.

Obviously there is no treatment applicable as a curative measure. Prevention, however, is simple, consisting as it does of docking before the danger period of life occurs. In the case of ewe lambs which it is necessary to dock early, the tails should be left sufficiently long to permit of another joint being removed if found advisable later on, to reduce condition by bleeding, and so prevent further losses by the disease.

In spite of this information, published nine years since, there is still reason to believe that the idea that "wool balls" in the fourth stomach, the true digestive stomach, are the cause of death still exists in the minds of some farmers. But that idea is absolutely fallacious. In 1912 arrangements were made for Inspectors at meat-export works to examine a number of the fourth stomachs of fat healthy lambs killed for export. Of 4,043 examined, 792, or 19·58 per cent., were found to contain "wool balls."

### BLOOD-POISONING IN SHEEP AFTER SHEARING AND LAMBS AFTER DOCKING.

Blood-poisoning in sheep and lambs now causes a mortality very small in comparison with what occurred regularly until a few years since, previous to which the annual death-rate caused by it was far too heavy. A bulletin on the subject (Leaflets for Farmers, No. 58) was written by Dr. Gilruth in 1909, and in this a very full description of these troubles is given. Copies are available on application to the Department in Wellington or to any Inspector of Stock. As is shown in this leaflet, the condition of blood-poisoning is set up through a particular micro-organism (the bacillus of malignant œdema) gaining entrance into the system of the sheep or the lamb through wounds or abrasions accidently occurring during shearing, or through the wounds made in the operations of cutting and tailing. In nearly every case investigated it has been shown that the animals became infected through dust or dirt from contaminated sheep-yards or their immediate surroundings coming in contact with the freshly inflicted wounds. Lambs are now usually cut and tailed in temporary yards formed by hurdles in paddocks, and this practice has given successful results from the point of view of prevention. But it alone is not always sufficient. In one instance which came under my personal notice there was no reason to believe that the yards used were infected, but the human element failed badly. The instrument used was a knife which the operator (whose ideas of cleanliness were far from being up to date) was in the habit of making use of for all sorts of purposes, including the skinning of dead sheep, and it was evident that he took no pains to keep it properly clean. A number of the lambs died of blood-poisoning within forty-eight hours, and a very careful and thorough investigation made on the spot failed to show any other source of infection than the dirty knife.

It must be remembered that the particular micro-organism which causes this form of blood-poisoning is one that reproduces itself by spores (which may be likened to seeds), and that these spores can

retain their vitality outside the animal body, especially in the soil, or in the dirt which accumulates in the handle-socket of a dirty knife, for a long period. A ground-surface badly fouled by dung, or a knife fouled by use on dead sheep and not properly cleansed afterwards, is always dangerous from the point of view of blood-poisoning. The majority of sheep-yards are evidently not contaminated by malignant œdema, since no trouble caused by this disease occurs at shearing-time among sheep held in them; but whenever sheep die of blood-poisoning after shearing radical steps should be taken to prevent future trouble. One of two things must be done:—

(1.) The provision of new yards on clean ground. As this necessitates also the erection of a shearing-shed, it means the incurring of considerable expense. At the same time there are some shearing-sheds in the Dominion which could with advantage be abolished and replaced by better and more up-to-date buildings.

(2.) The removal of the whole of the surface soil of the yards to a depth of at least 6 in., and preferably 1 ft. Saturating the newly exposed surface with a solution of non-poisonous dip of a strength not less than 5 per cent., and after this has dried giving a heavy coating of lime. After applying the lime, the replacing of the removed soil by clean earth taken, in flat country, from well below the surface (but never from land inclined to be swampy), or from a cut into a hillside whenever possible.

Lambs should never be cut and tailed in sheep-yards, as, even if the organism of malignant œdema be absent, they are more susceptible to the effects of the contamination of newly inflicted wounds by dirt than are older sheep.

Where outbreaks of this disease have occurred at shearing-time it has been at times noted that contamination of the shearing-shed itself has been suspected by the owners as being responsible. Our usual experience, however, is that the source of the trouble lies in the yards; though some of the sheds, together with the ground-surface below their gratings, have certainly been in a very dirty condition—one which, on general principles of reasonable sanitation, should not exist.

The symptoms of blood-poisoning are very pronounced, and are not likely to be mistaken for anything else. They usually appear within from twenty-four to forty-eight hours after shearing or docking and tailing. The most characteristic feature is a well-marked swelling, which quickly becomes dark-coloured — in fact, almost black — and gangrenous. In the earlier stages the animal moves stiffly when forced to movement, gradually becomes more and

more dull and listless, is off feed, and is obviously in a very bad way. Marked lameness is noted in the early stages when infection gains entrance through wounds in the leg after shearing. In grown sheep recovery sometimes takes place, especially if the point of infection is situated in the lower portion of a leg. Whatever mortality occurs is all over within four or five days at the outside in the case of sheep, and usually within two days with lambs.

Attempts at curative treatment are of practically no value. Prevention, which can be secured by the possession of the necessary plain knowledge and the putting of it into practice, is the one thing necessary for the avoidance of loss through this particular manifestation of blood-poisoning.

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## MILKING-TUBES: A WARNING.

A TARANAKI farmer has written to the Department regarding a milking-apparatus which is evidently on sale in the Dominion. His letter reads as follows:—

"No doubt you have come in touch with the —— milking-machine, composed of rubber tubes and silver siphons to put up the cows' teats. Unfortunately, I bought three of them last February, and I had not used them three days before ten or twelve cows were suffering from swollen udders. I had to stop using them, and all the cows came back right again except one, which became so bad that her back was up. I drenched and rugged her and saved her life, but the back half of her udder mortified and dropped off. Will you kindly write me your opinion of this machine, and if you know of any one else who has been 'had' with it. I think it is a pity such things are sold in New Zealand for milking."

The condition set up in these cows is just what might have been expected to happen as a result of the use of such an apparatus in the hands of a dairy-farmer. Quite apart from the risk of setting up inflammation of the udder through direct injury to the tissues, resulting from the tubes being pushed too far up the teat, or through the introduction into the udder of germs capable of setting up an inflammatory condition, the continued daily use of teat-tubes for milking cows is very undesirable. Muscles guard the outflow of the milk from the teat, and in time it would probably be found that muscular relaxation has been caused to a sufficient extent to make the cow unprofitable through leaking away of the milk.

# AN IMPROVED FIRELESS CHICKEN-BROODER.

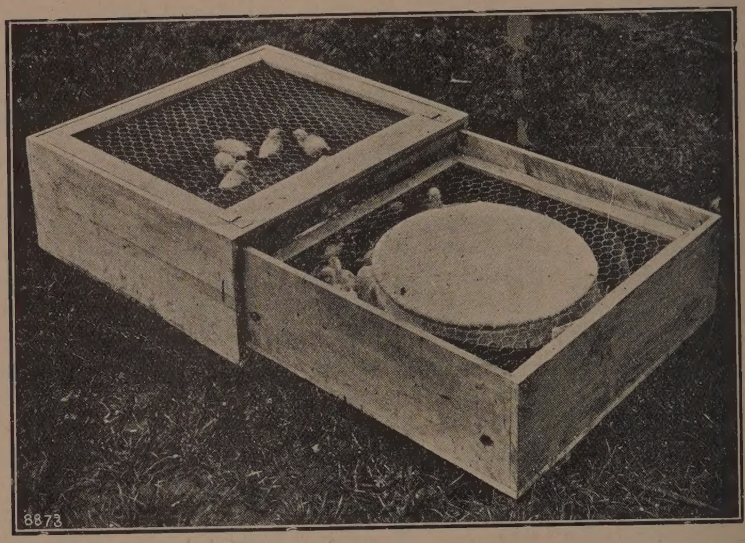
F. C. BROWN, Chief Poultry Instructor.

A NUMBER of inquiries have been received lately for particulars in regard to making an inexpensive fireless brooder for indoor use. There are many different styles of fireless brooders, but the writer cannot do better than reproduce the hover described in the *Journal* for August, 1912, which was designed by Mr. A. Carr (formerly Manager of the Department's Milton Poultry-station), with the addition of an improved brooder-box. The chief modification in the brooder now presented is that it is made on the drawer principle. One of the chief difficulties in the work of fireless brooding is that experienced in getting the chicks, when very young, to go under the hover after being allowed in the run for feeding and exercising purposes, owing to there being no artificial heat available to induce the little ones to go there. As will be seen by the illustration, the drawer provided practically eliminates the usual practice of pushing the chicks under the hover by hand.

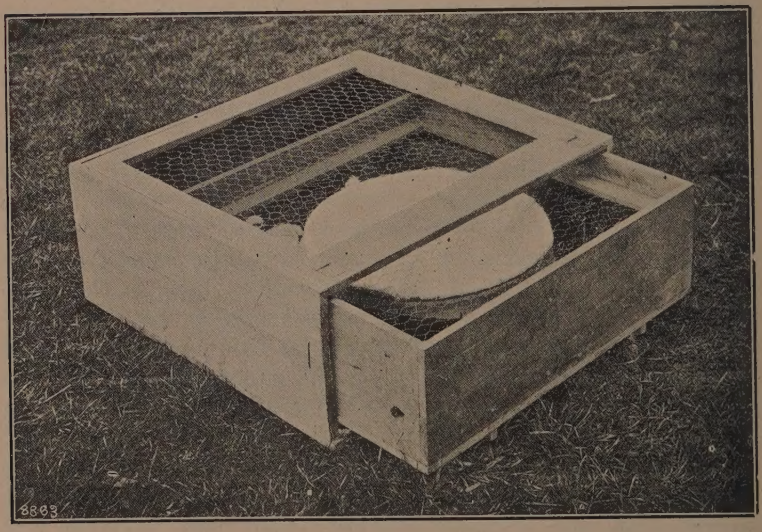
The brooder-box (in which the hover is placed) to accommodate fifty chicks should have an inside measurement of 30 in. by 30 in. Its height is 10 in. over all. The outer compartment, into which the brooder proper slides, is 32 in. by 32 in. outside measurement, the height being 13 in. over all.

The frame of the hover referred to is circular and made of sheet zinc, 1½ in. deep, with a ½ in. flange top and bottom (the rim of a bicycle-wheel with the spokes taken out will serve the purpose). This frame is supported by three flat legs 1½ in. wide, turned in at the bottom 1 in. These legs are adjustable, being made of two pieces of zinc, one of which is an extension of the other, and they allow for an expansion from 3 in. to 6 in. A hole is made in the inner piece and a groove in the other, and with the aid of a small screw-bolt and a thumb-screw the hover can be raised as the chickens develop.

The piece of pure-wool blanket which covers the hover may be fastened on with a piece of strong string, fine wire, or a narrow leather strap with a buckle attached. Care must be taken that the blanket is given sufficient sag in the centre to actually rest




THE IMPROVED FIRELESS CHICKEN-BROODER.




THE BROODER WITH DRAWER PARTLY CLOSED.

on the backs of the chicks. The two curtains of the same material which suspend from the cover are drawn tightly round the frame, and the ends fastened with safety-pins. In fixing the curtains it is essential, so as to avoid draught on the chicks, that the cuts in each curtain are not directly opposite each other. The outer flap should always cover the inner cut. It is also important to see that the ends of the curtains are not allowed to lie flat on the floor, otherwise the chicks are apt to huddle on them, with injurious results. The curtains should merely touch the bedding and no more.

All corners in the brooder must be avoided, so as to prevent the chicks crowding. The corners can easily be rounded with pieces of strong cardboard or linoleum tacked in place, thus making the interior circular. When the chicks are first put in the brooder a piece of cardboard or similar material should be placed unattached around the hover and about 2 in. from it. This will greatly assist in making the chicks remain under the hover, and prevent them from becoming chilled.

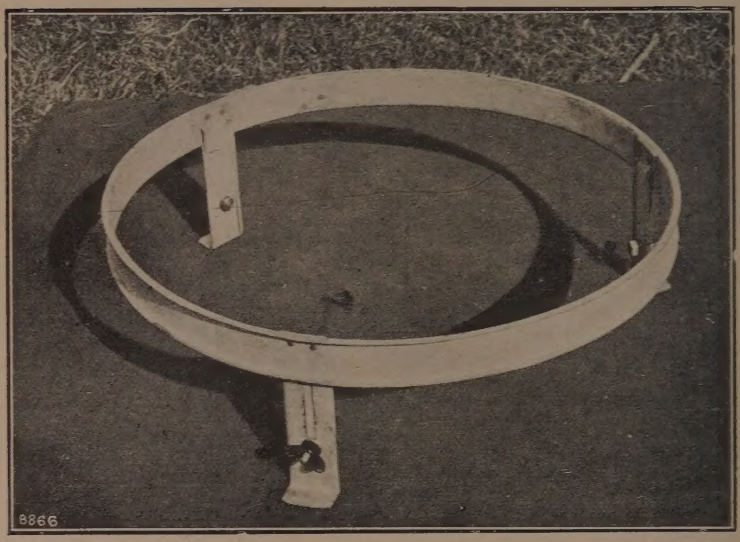
For bedding dry cabinetmaker's sawdust is suitable. On no account must sawmill dust be used. Oaten straw chaff will do, care being taken that there is no grain in it, as oats are fatal to very young chicks. Thoroughly dried fine grass hay made in the form of a nest in which the hover stands may also be used.

The floor of the brooder proper should be made of well-seasoned T. and G. boards closely fitted. It is essential that the floor be made absolutely draught-proof, or failure is invited. To lessen expense the floor of the outer box may be made with ½ in. lining. On the bottom of the brooder two runners, 1½ in. by 1 in., are fixed with the narrow edge downwards. This enables the brooder to be easily pushed in and out. A door 2 ft. long and 6 in. high is hinged at the top to admit the chickens to the second compartment. A similar door at the end of the outer box gives entrance to the next stage of the run.

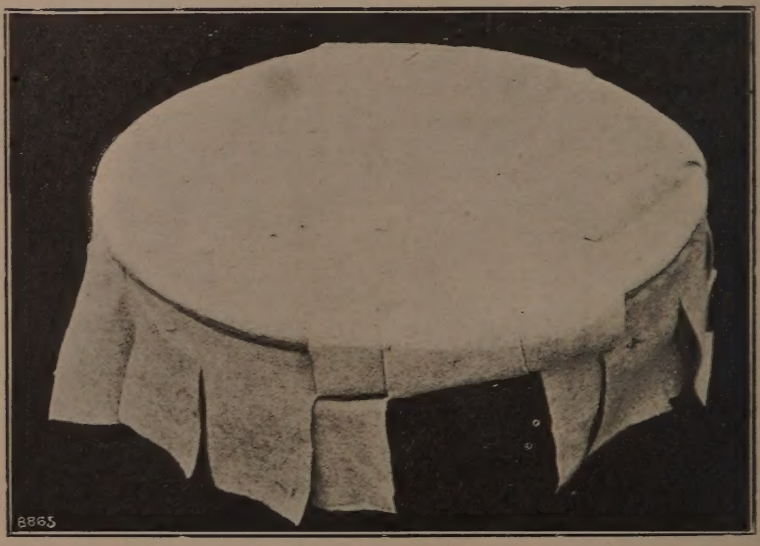
A movable frame is provided, which fits inside the brooder and prevents the chicks from hopping out and jumping on top of the hover. It is made of 1½ in. by ½ in. material, covered with ¾-in.-mesh netting. Small holes bored at each corner of the box, one above the other, ½ in. apart, in which 2½ in. nails are placed, serve as a means of adjusting the height of the frame as the chickens grow older.

### POINTS IN MANAGEMENT.

It is always a wise plan to remove chicks from the incubator to the brooder at night. They will settle down much better




THE HOVER FRAME.




THE HOVER COMPLETE.

under the hover than when moved during the day. The chicks should be kept in the brooder proper for the first three days. On the fourth day they should be allowed in the outer compartment, commencing with half an hour at first (at the most favourable time, of course) and gradually extending the time until about a week, when they may be given the next stage of the inside run. The weather conditions must always be studied before allowing the chicks in the out-of-door runs.

At feeding-time, for the first three days, the hover should be lifted out and the chicks fed on a shallow tray. After giving the little ones time to have their meal, the tray should be removed and the hover put back in its place. From the first, clean water, grit, and charcoal should be always before the birds, and fed separately.

The fireless brooder is strongly recommended for rearing ducklings, provision being made for an ample supply of fresh air, which is the key to successful duck-rearing.

This system of brooding chickens without any artificial heat can be employed either indoors or outside, but to obtain the best results it should be worked under cover. This is not only best for the comfort of the chicks but also for the attendant during rough weather. It must also be remembered that to make a brooder for outside work demands a much greater expense than for one worked indoors. In the first place it is essential that the outside brooder be made watertight as well as draught-proof. To use a makeshift apparatus for any outdoor brooder is only inviting trouble.

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*Intercultivation.*—In all districts subject to dry summers the question of putting at least a portion of the arable land under intercultivated crops should receive attention. By *shallow* surface cultivation a mulch is kept upon the surface, and soils thus treated part with their moisture far less rapidly than where intercultivation is neglected. One repeatedly sees abundant crops of kale, maize, &c., so treated standing alongside crops of the same kind grown in the same paddock but not intercultivated, and which in consequence had withered and died. A few acres so grown will often decide as to whether the stock can be kept going till the rains come, or must be sold at whatever they fetch. The cost of a little additional cultivation becomes a matter of very small import if it is the means of saving a loss of perhaps over 50 per cent. in the value of the stock.—*G. de S. Baylis.*

# FEEDS AND FEEDING FOR DAIRY STOCK.

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## THE SCIENCE OF FEEDING.

RESEARCH, particularly the work of Kellner, among other scientists, has taught us many facts about the mammary gland of the cow, of which milk is the product, especially as to the behaviour of the gland during certain portions of the lactation period and under the action of particular foods or their elements. Research has also taught us the important fact that the food can only exert an influence upon the quantity and quality of the milk within the range of development and productiveness of this organ. In other words, the power of the mammary gland to secrete much or little rich or poor milk is hereditary, and the effectiveness of the food for milk-production is regulated by this inherent factor. How important, then, is the testing of the individual, irrespective of the breed, so that the maximum results may be obtained from the food fed and the management exercised! Kellner in particular makes mention of the fact that the individuality and breed of the animal and the condition of the mammary gland as influenced by the period of lactation have the greatest effect upon the milk-yield. He stresses the fact that the food, along with other factors, plays a less important part, and that it only exerts an influence within the *capacity* of the mammary gland. It is, he declares, upon the food, however, that the *efficiency* of this gland very largely depends.

The mammary gland is most active shortly after the birth of the calf, and it is then, we are informed, that the greatest latitude is left for the action of the food. Later, when the gland from natural causes loses more and more of its activity, the most liberal feeding cannot maintain the milk-yield at its former high level. Too much food in the second half of the lactation period, therefore, causes the deposition of fat, states the authority, and when the mammary gland is fat its capacity is reduced. This fact would point to the advisability of apportioning supplementary feed, fed because of declining pasture, so that the greedy animals will not get too much and thus not tend to develop fatty mammary glands as the lactation period advances. Liberal feeding of the cow during the first half of the lactation period is therefore

both necessary and economical, while during the second half moderate, though not scant, feeding is called for.

As above indicated, research also reveals the fact that the quality of the milk cannot be influenced to any appreciable extent by enriching the food fed, for the mammary gland on secreting can only yield fluid whose variation in composition from time to time, under normal conditions of animal maintenance, is slight.

The feeding of a scanty diet immediately after a liberal one does not, as a rule, at once affect the mammary gland, a portion of the milk being formed from body substance (flesh and fat); and the cow may lose weight appreciably without the yield of milk undergoing any noticeable reduction. As a rule, states Kellner, there is, however, a rapid fall in quantity. In like manner, if a pregnant cow is insufficiently fed, we are informed she has to draw upon the body fat and flesh to meet the demands of the developing fœtus. This undue strain is bound to affect the productiveness of the cow during her next lactation period, and is also bound to unfavourably affect the capacity of the mammary gland — hence productiveness — of the heifer ultimately resulting from the ill-nourished dam. Here, truly, is the reason for the statement "the basis of dairying is the maternity of the cow." A disregard of this principle alone in some parts of the country means a loss annually to the dairying industry of New Zealand. During the period of pregnancy, and for some time after, the dairy cow requires a fairly liberal allowance of food well supplied with protein (a nitrogenous compound). This should be supplied in the form of lucerne or clover hay or ensilage stored for winter (the usual pregnant period), or provided either in exceptionally good winter pasture or in winter soiling-crops that embody legumes, which are rich in protein.

Protein is most essential to the system of the milch-cow, not only for maintaining the tissues of the body but also for maintaining the yield of milk, for if the allowance of protein is diminished, although there may be a sufficiency of sugars, starches, and fat in the food, the quantity of milk produced decreases rapidly. The reduction of protein does not, however, appreciably affect the quality of the milk, says Kellner, except when the reduction is so far carried that the animal is forced to draw upon its body supply of milk-constituents. It is only when the body is much reduced in protein that the milk becomes poorer in fat and more watery. It is further stated that the amount of digestible protein which is essential for the production of a given quantity of milk depends to a certain degree upon the

starches, sugars, and fat in the food. It is claimed by Kellner that just as fat, starches, and sugars can diminish protein metabolism (body-building processes) in the formation of flesh, so can they also act in the production of milk. Indeed, it is possible, he states, by the plentiful supply of starches and sugars to so reduce the metabolism of the food-protein in cows that no more is decomposed than the animals require for the actual maintenance of life. We are informed that this saving can go so far that all the digestible protein substances above that needed for maintenance of life (½ lb. per 1,000 lb. live weight) can be utilized for the formation of milk without any call being made upon the protein of the body. Such a result is possible not only when moderate yields of milk are got, but when large quantities daily are obtained. The authority affirms that this fact is of great practical importance, for by feeding large quantities of sugars and starches (in the form of mangels, swedes, carrots, millet, sorghum, kale, chou moellier, cabbage, maize, &c.) the quantity of concentrated food or fodders rich in protein can be profitably reduced.

Important as is this fact it does not, however, justify the protein-content of the milk being taken as a measure of the protein to be given in the food. Indeed, it is stated that a certain excess is necessary in order to counteract the weakening which the gland experiences as the period of lactation advances. If the supply of protein in the food were limited to that which appears in the milk, the natural decrease in the milk-yield, we are told, would most certainly be more rapid than if a food richer in protein were fed.

Kellner sets the standard that the dairy cow should be fed per day, feed furnishing 2½ lb. protein, 12½ lb. carbohydrates, and ½ lb. fat. Feeds containing a greater proportion of protein than called for by this standard, he states, can be fed, because protein can take the place of the other materials. Sugars, starches, and fat cannot take the place of protein, however, and no matter in how large quantities they may be fed, if protein is lacking the production will be less.

## PASTURE VALUE.

Every farmer knows that good pasturage produces rapid growth, good gains, and abundant milk-yields. According to Henry, the American authority on the feeding of stock, it furnishes nutriment in the proportion of 3 lb. protein, 12 lb. sugars and starches, and ½ lb. fat per cow per day. This ratio practically conforms to

the standard of Kellner stated above. The latter states that good pasture plentifully supplied with clovers contains more protein than is necessary, hence the feeding, if feasible, of straw —preferably oat-straw—is both profitable and economical in that it tends to "balance" the ration consumed by the animal. Provided the pasture is good, no supplemental feeding will be required.

### SALT.

According to Henry, salt, at the rate of ¾ oz. to 1 oz. per cow per day—a reasonable allowance—is necessary, and this should be supplied in any convenient manner. Salt, of course, can also be given in the form of a rock-salt lick, which is best placed in convenient positions near the water-supply.

### FLAVOURS IN MILK.

Apart from the effect which ordinary foods of good quality exercise through the nutrients which they contain, there are, according to very prevalent views, other powers which affect the productiveness of flesh or milk for good or ill. It certainly cannot be denied, affirms Kellner, that when a feeding-stuff agrees with an animal the nutritive value can be increased, and that palatableness not only influences the consumption but also the food value, particularly with animals like milch-cows, which are easily affected by nervous impulses. It is well known that all musty and mouldy foods spoil the taste of the milk, and more particularly that of the butter, and that this bad effect can continue for some time after the damaged food has been stopped. The same evil effect is produced when spoiled silage or green forage that has lain too long in thick rows is fed. Good meadow-grass, clovers, lucerne, mangels, swedes, carrots, fresh maize, Buda kale, cabbages, chou moellier, oats and peas, ryecorn and vetches, millet, crushed oats, well-cured hay, well-made silage, &c., all produce sweet flavours in milk.

Turnips cause objectionable flavours, and, as this is one of our staple forage crops in New Zealand, the prevention or minimizing of turnipy flavours in milk is one of our pressing problems. If a dairy-farmer is compelled to feed turnips to dairy cows he should always feed them after milking. Indeed, the feeding of any supplemental feed to cows before or when milking is not a commendable practice. The breath of the cow that has been previously feeding on turnips transmits turnip flavour to the milk, and when a cow is feeding while being milked dust is raised, thus contaminating the milk. If cows are fed turnips immediately after milking

the tendency for the milk to assume turnipy flavour is somewhat minimized. While turnips are not a highly desirable food for milk-cows, yet they can be fed in moderation, and should be fed together with fodders such as good meadow hay, lucerne hay, oat-straw, pea-straw, oaten chaff, and ensilage, which tend to offset the objectionable flavour of the turnip. Certain turnip varieties are believed to be less prone to cause flavours than others. To avoid the labour of lifting turnips the cows could be turned into the turnip-field for a comparatively short period, then fed good hay or chaff. But the lifting of the turnips and feeding them out (sliced) to the cows is more economical and productive of somewhat better milk. In feeding turnips care should be exercised in feeding no rotten or badly diseased roots. As the turnip contains on the average 91·5 per cent. of water, it is in itself not a satisfying food for an animal, and particularly a dairy cow—an additional reason why dry feed should be fed with the turnips, in a manner most convenient to the farmer. It is here assumed that the dairy-farmer would not be feeding turnips, with or without dry feed, if good pasture were plentiful.

### SUPPLEMENTING THE PASTURE.

Except in the most favoured parts of the country, as regards climate and soil, plentiful pasture is not maintained the year round. Hence supplemental feed, to add to the periodic declining pasture, is desirable and in many instances necessary. On the lighter soils especially this need is frequently most felt as the summer advances and autumn sets in. Under such conditions the supply of soiling (green-feed-producing) crops is highly desirable. Lucerne, cut first when coming into flower and the cutting continued as required, furnishes perhaps the finest soiling-crop. About 10 lb. per head per day will be enough at the start, and the quantity can be increased to 15 lb. If green maize is available a more economical and better-balanced ration would be 7½ lb. lucerne and 15 lb. green maize per cow per day. Lucerne, like all legumes, is rich in that valuable nitrogenous compound protein, while maize is low in protein and rich in carbohydrates (starches and sugars). Thus the feeding of these two in definite ratio, 1 part by weight of lucerne to 2 of maize, makes for economy of the valuable protein, yet also for high productiveness.

Other valuable soiling-crops for feeding, where necessary, to cows in summer and autumn are as follows:—

Peas and oats (1½ bushels seeding per acre of each)—a more or less "balanced" ration.

Buda kale—a most succulent and palatable fodder (usually 8–10 lb. broadcast or 4 lb. in drills).

Western Wolths rye-grass—for strong soils (30 lb.).

Italian rye-grass (20 lb.) and cow-grass (4 lb.), or vetches (1 bushel).

Sorghum (5 lb. or 6 lb. drilled or 20 lb. broadcast).

Millet (about 12 lb. drilled or 16 lb. broadcast).

Prairie-grass (60 lb.), or prairie-grass (40 lb.) and cow-grass (4 lb.).

The rates of seeding per acre given in parentheses are standard and must vary with soil and climate.

These crops, if necessary, could be sown at different dates in the early summer, so as to come in later to supplement the failing pasture in the event of such decline being expected. Though the falling-off of the pasture corresponds somewhat to the natural decline in the activity of the mammary gland as the lactation period advances, yet in certain circumstances, such as lightness of soil and seasonal deficiency of rainfall, provision should be made for maintaining the normal flow of milk, and for sustaining the animal later on during a period of still greater shortage of food, by providing these invaluable supplemental pasture crops. Legumes (lucerne, red clover, cow-grass, peas, vetches, and, where they can be grown, cow-peas and soya beans) should play an important part in connection with the provision of these supplemental soiling-crops. They are abundant suppliers of protein (so important to milk-production), nitrogen-enrichers of the soil, and transmitters of lime to the animal. An economical method of growing such leguminous crops is to utilize stubble-fields or to sow after the last cultivation of maize, where grown.

## THE IMPORTANCE OF LIME TO DAIRYING.

Hart and McCollum, of the Wisconsin Experiment Station, found that a cow yielding 30 lb. of milk daily requires a minimum of not less than 2 oz. of lime per day. How important, then, is liming to dairying, and, indeed, other lands; and how essential are legumes as conveyers of lime to the cow, for legumes per given weight take up more lime from the soil than any other order of plants.

## BALANCING RATIONS.

The dairyman who grows great crops of maize, and is largely dependent on them for silage, must also have broad fields of clover, lucerne, or some other legumes to help to round out the

ration. On the subject of nutritive values of grasses, clovers, &c., also the balancing of rations under natural conditions, farmers will find useful information in the Department's Bulletin No. 52 (new series), also in an article on "The Growing and Utilization of Forage Crops," published in the *Journal* for July, 1915, both by the present writer.

### RATES OF FEEDING.

In winter, when the pasture is scant, and when good legume hay and maize ensilage have previously been produced on the farm, the daily allowance per cow should not be less than 15 lb. hay, 40 lb. maize ensilage, and 40 lb. mangels. Where maize and lucerne are made into ensilage in the proportion of 2 to 1 (an excellent combination), about 25 lb. of this mixture, together with a little hay and mangels, will be good treatment. A liberal supply of roots such as mangels will largely eliminate the need for any concentrated foods; and a full ration of ensilage composed of 2 of maize and 1 of lucerne will entirely eliminate the need for these expensive foods. Of course, it must be understood that such winter feeding is recommended only for districts calling for it—districts where more or less scant winter pastures obtain—and that the above-mentioned quantities of fodders apply to milch-cows of average feeding-capacity.

### SOILAGE AND SILAGE.

The wise dairyman will provide sufficient soilage (green-feed-producing crops) and silage to make good all possible shortage of pastures in summer or winter. Soilage and silage enable the dairyman to maintain the maximum flow of milk at the minimum cost of production, regardless of season. In the event of summer or autumn soilage crops (enumerated above) in part not being required for green feed, they can be made into ensilage, preferably by means of a silo, and so reserved for winter feeding. In like manner, any surplus of pasture or suitable forage crops could be so preserved and held over for a period of scarcity. It is thus that the ill effects of a drought can be greatly minimized.

### WINTER FEED CROPS.

Crops specially suited for providing soiling or depasturing in winter are the following, the seedings given being per acre:—

Emerald ryecorn (1½ bushels) and Scotch or Winter vetches (1 bushel).

Cape barley (2 bushels) and vetches (1 bushel).

Russian Black Skinless barley (2 bushels) and vetches (1 bushel).

Prairie-grass (40 lb.) and cow-grass (4 lb.).

Canary-grass (*Phalaris bulbosa*) (30 lb.)—for strong soils. This is more suited for dry cows than for cows in milk.

Western Wolths rye-grass (30 lb.)—for strong soils.

Buda kale, 8–10 lb. per acre broadcast or 4 lb. drilled.

Thousand-headed kale, 8–10 lb. broadcast or 4 lb. drilled.

Western Wolths and the kales are specially suitable for early winter and late winter or early spring, while the others come in any time during the winter. Each can be sown so as to come in at the time or times indicated. For drained swamp land Western Wolths, Italian rye-grass, canary-grass, cow-grass, and kale are each specially suitable. Where hay, ensilage, and roots have been provided in addition to winter green feed, the latter can still be fed to advantage in moderation, and will be acceptable in the spring when the winter's supply of stored fodder is about used up. It is at this time, after the cow has calved, that abundance of food is required to nourish the animal, which also at this stage of the lactation period can make the fullest use of the food fed. All feed should as far as possible be fed after the cows are milked.

## SEED OF FORAGE CROPS.

As seed of certain valuable winter forage crops is as a rule expensive, the suggestion is here offered that farmers in dairying districts might co-operatively grow, on small areas of land set aside for the purpose, sufficient seed for their own use and for the remunerative sale of any surplus seed.

## CONCLUSION.

In conclusion, I would emphasize the following points:—

(1.) Study the individual characteristics of your cows and their requirements as far as possible, and feed accordingly.

(2.) Grow lucerne if at all possible, it being invaluable in dairying.

(3.) Make your surplus feed into ensilage, or, if feasible and to your advantage, grow maize and convert the surplus of this into ensilage, preferably by means of a small or medium-sized silo.

(4.) Grow mangels, and make fairly liberal use of these most palatable roots, after storing for not less than a month.

(5.) Grow winter-feed soiling-crops, and, where necessary, summer soiling-crops.

(6.) Treat the pregnant cow well, for the maternity of the cow is the basis of dairying; and make the most of pasture or other feed during the first half of the lactation period.

(7.) Endeavour to "balance" rations under natural conditions, by growing together, or bringing together in feeding, forage crops rich in protein on the one hand and those rich in carbohydrates (sugars and starches) on the other. A standard example of this is 1 part by weight of lucerne to 2 parts of maize—in the form of ensilage. Another is the growing of peas and oats together in about equal seedings.

(8.) Cultivate to some extent your pastures in the early spring by light harrowing; top-dress occasionally with lime as well as with manures. As far as possible follow a definite rotation in pasturing your fields, thereby conserving the mineral wealth of the soil and making for economical production. Break up old unprofitable pastures and sow a good clean mixture suited to the soil. Always keep in mind that the pasture crop is your staple crop and should be treated as such.

(9.) Feed turnips only after milking, and feed them in moderation with, if possible, dry or absorbent feed such as hay, oat-straw, pea-straw, chaff, or ensilage. Eliminate, or at least minimize, turnipy flavours as far as possible.

(10.) Deep-rooting legumes such as lucerne, white clover, grass-pea, *Lotus corniculatus*, &c., and grasses such as cocksfoot, prairie-grass, Western Wolths, meadow-fescue, tall oat-grass, &c., should be grown as far as possible in Taranaki.

The saying that "half the breeding goes down the throat of the cow" still holds good, and it is upon the intelligent feeding, whether by natural or artificial means, or by both, that the expansion and maintained efficiency of the dairy industry very largely depends.

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# GRAFTING.

W. H. TAYLOR, Manager, Arataki Horticultural Station.

WHILE grafting in itself is a very simple operation, so far at least as its mechanical performance is concerned, yet there are principles underlying it that cannot be ignored with impunity, and in carrying it out a number of factors have to be understood if the operation is to be always successful. The work must also be accurately done. Neatness of the work and accuracy of the cuts both exercise great influence on the operation. The first requirement is to understand the principles. When these are grasped the operator knows exactly what is required; he knows when all conditions are right and exactly the kind of material to work on. A person may be able to put on a number of scions and get a large percentage of takes. But if one graft can be put on right, why not all? Simply because of the lack of accurate knowledge, or insufficient skill, rendering the work more or less speculative. Failures may occur from using improper wood as scions, from bad stocks, from bad workmanship, or doing the work too early or too late, or with scions not properly kept.

## THE SCION.

It is generally recognized that the scion should be in a more backward state of growth than the stock on which it is to be grafted. The reason why should also be understood, and then carelessness in this matter would be less frequent. A scion is really a tree without roots. It has no means of supplying itself with food; that is the function of the stock. It should be clearly realized that as leaves come before roots, so top growth must be made by the scion before a union can be formed. The conditions required are that the stock shall be pumping up sap, which the scion does not immediately require, as the top growth has not begun. The junction of stock and scion being sealed up, the sap from the stock keeps the base of the scion fresh while the buds are breaking. As soon as the buds begin to push, their reciprocal action between scion and stock causes a union. Now, presuming that the scion were in a more forward state, with buds breaking when put on, it would require immediate sustenance; and as that could not be obtained, on account of there being as yet

no union, the growth of the scion might advance a little, but the whole would die. It may be asked, Why not put the scions on while the stock and scion are both dormant? This is frequently done, but the stock must not be dormant long or the scion will dry up.

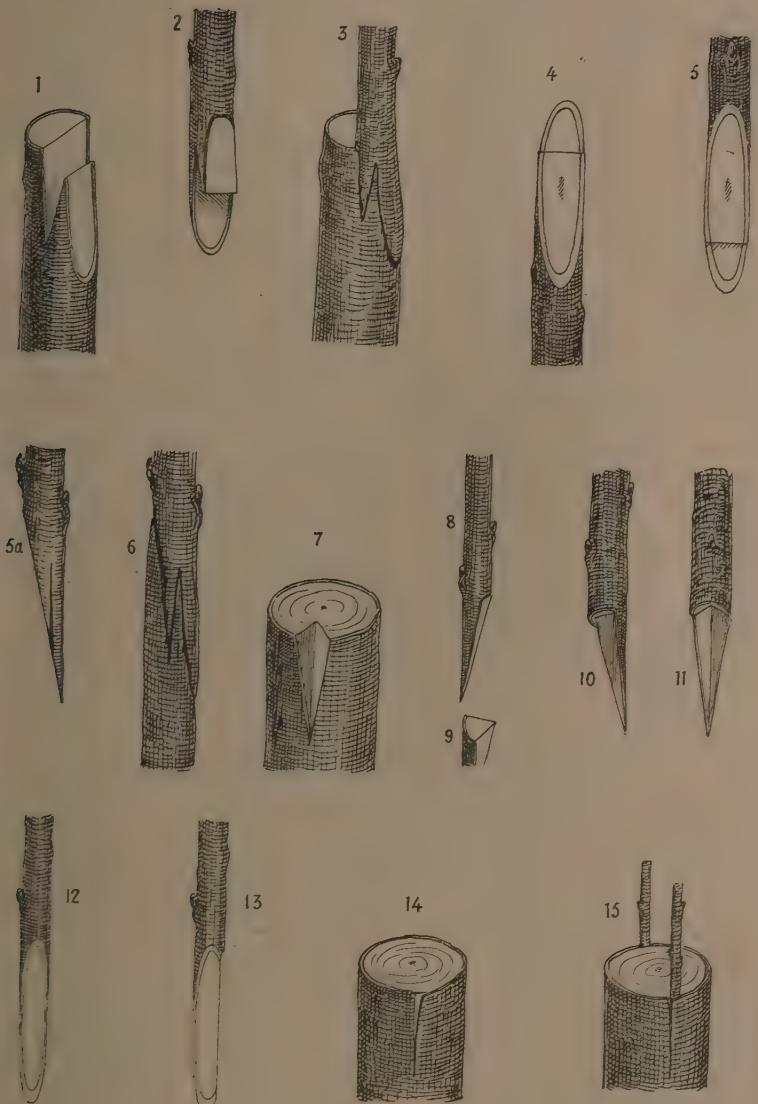
It is important that the scions be kept in good condition until required for working. They may be taken at any time while the trees are dormant. Mid-June is generally advised, but a month later is quite as good a time. The scions should be perfectly healthy wood of last season's growth. Choose wood of fair thickness—thin scions get but a feeble hold, and, moreover, are liable to wither if the weather should be hot and dry after grafting.

The scions should be buried in the ground in a cool place where the soil never becomes dry, but also never overwet; near a hedge is a good place. The scions should not be laid in bundles, but spread rather thinly, so that soil may come in contact with them all, otherwise the bark may be injured by insects and even sometimes become affected by fungi.

## GRAFTS AND GRAFTING.

Grafting-time having arrived, the first thing to do is to get the necessary material ready—raffia for binding and wax for sealing up the union. Broad strands of raffia should be used, so as not to cut the bark. Wax I make of equal parts of beeswax and resin thinned with linseed-oil—roughly 2 lb. each of wax and resin, and half a pint of linseed-oil. Tests should be made to get the right proportion of oil. This preparation has the merit of simplicity, but as beeswax is now very expensive a receipe without beeswax may be given as follows: 8 lb. resin, 3 lb. tallow, 3 lb. red ochre, 1 lb. Burgundy pitch; melt together in an iron pot, adding tallow and ochre last; do not make too hot. The wax or other sealing compound must be applied in a melted state, not too hot, and applied with a paint-brush. Wire the brush on before using, or it may melt off at the handle.

If young stocks are to be worked the scions are put on by the whip or tongue method. The cut in the stock and the scion should match each other. I do not like the cuts too short, as there is not enough surface to make a strong union; they should be about 2 in. long. Use a very sharp knife and cut clean, straight, and decisively, with no inequalities of surface. The fit should be perfect, so that when united stock and scion appear as though glued together. When making the tongues do not start in the middle of the scion or stock. In the case of the stock start half-




GRAFTS.

1, 2, 3. Whip graft for use when stock is thicker than scion. 4, 5, 5a, 6. Whip graft for use when stock and scion are equal in thickness. 7, 8, 9. Notch graft: scion for old trees, and section of scion. 10. Improved notch scion with shoulder. 11. Front view of No. 10. 12, 13, 14, 15. Rind graft (Fig. 13 showing scion with squared edge).

NOTE.—Figures of whip and notch grafts drawn from sketches by Mr. Taylor, illustrating methods followed by him.

way between the pith and the top; and with the scion commence half-way between the pith and the lower point of the scion. Cut into each about 1 in. When the tongue of the scion is pressed down into the stock the lower end will exactly meet the bottom of the cut in the stock, and the upper parts of each will also meet, so that no cut surface is visible at either end.

I am aware that the manner of making the cuts for the whip graft as described above is not in accordance with the usual practice. The cuts are longer; and although I do not object to the shorter unions, yet I prefer the longer, as I consider that the greater surface of cambium layer effects a stronger union. It will be noticed that the strongest part of the scion so made is the centre wedge, which is usually the weakest part of the scion. I think this is beneficial, because there are four points of union in place of two. In the grafting of grape-vines this style of scion is the only one that gives strong growth; short unions are only a subterfuge with grape-vines.

The binding of the graft must be very firm, so as to keep all parts pressed close together. Tie so that the binding will not become loose, or the scion may rise in parts and a kind of callus form, preventing a perfect union. Further, if there is a lift anywhere, parts of the scion or stock may die, particularly the ends of either, which would not occur if contact were perfect. Care should be taken to use only wood with growth-buds—no fruit-buds should be on the scion.

There is some difference of opinion as to where the cut should be made on the stock. Some think that a bud should be left near the apex. Personally I like to leave a bud in that position, because I consider there is more vitality in the wood close to a bud. I know, however, that it is not a matter of much importance; it is insignificant with a perfect fit and proper binding. With the scion it is different. In my opinion it is imperative to leave a bud at the base of the scion. A cut is made so that a bud is left close to the bottom. The bud, of course, is covered by the raffia and wax, but its influence is present, and this method seems to be much better than having vacant bark at the thin end of the cut. For another reason tight binding and perfect fitting is imperative. The wax is put on while hot. If the fit is not perfect, if there is the slightest opening between the scion and stock, the hot wax may enter, and then the scion may fail, but more likely there will be an imperfect union and a diseased appearance.

The scion should not be too long; two buds exposed make it quite long enough, and there is less left to the drying influences of sun and wind than if it were longer. It is desirable to make the top cut rather short and to wax it over. This is not always

necessary, but I have had experience where no grafts would take unless the top was so waxed and drying thus prevented.

### REGRAFTING OLD TREES.

The method of making the scions for this purpose is quite different; rarely is the whip graft used, though it does come in occasionally. It is much better to work on the limbs than on the main trunk. The latter must be used, however, if the limbs are too high up the trunk, and also if there are not sufficient in the right position. Preparatory to grafting it is well to take most of the head from the tree a month or so before, so that the flow of sap may not be too copious. Some part of the head must be left, and should not be cut off till grafting is done. The method most frequently employed is the crown or rind graft. The bark only is lifted and the scion is slipped in, much in the manner of budding. The bark on one side only of the slit should be lifted; the scion should have a thin strip sliced off one edge to meet the bark on the side not lifted. The scion is prepared in a manner similar to the whip-graft scion, but no cuts are made in it. Secure a bud at the base as described for that method. These scions may be improved by cutting into them across the wood, then the downward cut as before, the purpose being to make a shoulder to rest on the stock. The advantage is less bulge of the scion and firmer fixing.

When working on the limbs some may be rather narrow for the rind graft. In such cases cut a triangular piece of wood out of the stock and make the scion to fit it exactly. These notch grafts are much better than rind grafts when the branch is not very thick yet too thick for the whip. The great advantage is that there is no broken bark, and it must be remembered that the raised edges of the bark always die. Although the notch is a better graft than the rind, if many were to be put on time might be a bar, as the operation takes longer. Again, there may be branches not above 1 in. in diameter to be worked. For those the whip graft should be employed. Tying and waxing must be as with the previously described method, and every cut surface should be waxed over, as such surfaces afford a ready means for the entry of diseases—silver-blight, &c. The question here arises as to which is best to cover with—wax or clay. Personally, I am inclined to the wax, which I have always used, and I have done a considerable amount of this work.

A difficulty often arises in forming these worked trees. When the scions are placed around the trunk there are likely to be two causes of trouble. Firstly, the branches rise too straight up; secondly, the scions as they swell to large branches may be too

close and come into contact with each other. Both troubles can be surmounted in this way: If wax is used for covering the scions the buds left at the base of the latter almost always grow. They break right through both raffia and wax and develop strong growth. Their union with the old wood is perfect. These branches grow out at an angle from the trunk, this being partly caused by the scion-growths above them. The higher shoots can be gradually removed and the basal ones left to make the tree. A proper spread is at once secured, and the butts of the branches do not collide with each other.

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# THE CATLINS DISTRICT MOSSBANKS.

## AN EXPERIMENT IN TREATMENT.

R. McGILLIVRAY, Fields Inspector, Owaka.

In the Catlins district, South Otago, there are large tracts of country more or less covered with what is known as "mossbank." These mossbanks are mounds or heaps of partly decayed vegetable matter lying on the surface of the soil and varying in depth from 1 ft. to 10 ft. or more. The mounds appear to have been formed much in the same way as peat, and could only occur in a humid climate. The acidity of all mossbanks is very marked, but that in the region of the kamahi forest appears to have a greater degree of acidity than that found in the pine forest. Under all mossbanks is to be found a hard black pan at varying depths, and generally of undulating formation. This pan is quite impervious to moisture. Blackberry, spurrey, and sorrel thrive on mossbanks, and rhubarb likewise responds to a dressing of this material. Patches of mossbank in a field give it an unsightly appearance. In some cases a good crop of turnips or oats is to be seen with perhaps half a dozen bare mossbank patches, which detract very much from the appearance of the crop and are an annoyance to a careful farmer.

During last summer some experiments were conducted on a typical piece of mossbank near Owaka, on the property of Mr. Keith Ramsay, of Dunedin. The entire area was ploughed on the 8th and 9th September, 1915. Two swing ploughs were used, one turning the furrow, and a second following with mouldboard removed, so as to act as a subsoiler and pan-breaker. The pan was broken to a depth of 26 in., but in places it was too deeply seated to be reached. The field dried rapidly after this treatment.

Plots were set out on it and various treatments accorded. On the 1st February, 1916, the following observations were made:—

*Effect of Lime.*—The effect of ground burnt lime was more or less marked on all plots on which it was applied, and the crop of oats and vetches was fairly proportionate in yield to the amount of lime applied. Thus, on the control (untreated) plot the crop was a total failure, the growth being only sorrel. The growth on the 1 ton lime, 1½ tons lime, and 2 tons lime (per acre) plots were respectively poor, light, and good. The effect of the heaviest dressing of lime was most marked on the vetches; a good growth of white and alsike clover also appeared in places on the heavily limed plots.

A MOSSBANK AREA.
(Stumped, and mossbanks partially levelled.)

*Effect of Heavy Rolling.*—No apparent difference that could be attributed specially to extra-heavy rolling was produced on any of the plots.

*Effect of Fertilizers.*—Where wood-ashes (potash) were applied to plots which were also limed the result was very satisfactory, an excellent stand of oats and vetches being secured. Basic superphosphate, applied alone at the rate of 3 cwt. per acre, failed to produce any effect that could be recorded as significant.

These results are suggestive, and in so far as they relate to the beneficial effects of burnt lime and potash are concordant with the results that have been noted elsewhere.

# SUMMER FORAGE CROPS FOR NORTHERN DISTRICTS.

J. BROWN, B.Sc.Ag., N.D.A., Director of the Fields Division.

## MAIZE.

AMONG the annual forage crops adapted to districts of fairly high summer temperatures it is doubtful whether maize—given favourable conditions—is surpassed either in yield or in nutritive value. It fulfils the more important requirements of a supplementary forage crop for dairy stock in that it is cheaply produced and easily handled. Maize, however, has certain limitations. Although by sowing early- and late-maturing varieties, or by successive sowings at intervals of two or three weeks of any early variety, the period during which it is available for feed is extended, its use for forage purposes may be said to be restricted to the months January to March, after which, except in unusually favoured localities, its growth is apt to be brought to a standstill by low temperatures. A frost-shrivelled crop of maize fodder is practically useless for the purpose for which forage crops are fed to dairy cows. Certainly maize supplies the want of succulent green feed until pastures freshen in autumn, but it will not be gainsaid that it would be an advantage in many cases to carry the supplementary forage feeding right into the month of May and even June.

It has been said above that maize is easily handled, but the handling of any crop implies labour, which, unfortunately, is none too plentiful on most dairy farms. It may therefore be considered a defect in maize that it cannot be pastured without excessive waste. Added to these disadvantages one must allow that maize is somewhat exacting in soil-requirements. It does not as a rule produce satisfactory crops for forage except on the better classes of land, and even on the latter the occurrence of a brief spell of dry weather is sufficient to provide a check to its growth from which it seldom makes a satisfactory recovery.

## SORGHUM.

It is with the view of suggesting more general trials of a few other crops with similar general adaptations to maize that these notes are written. The value of the sorghum crop as a source of succulent

feed for dairy stock is well known, but its use might be greatly extended in our northern districts.

Sorghum requires higher temperatures than maize for germination and early growth, and should not be planted anywhere before November. On dry soils, on poor soils, and on soils of a refractory nature it excels maize. The occurrence of dry weather and deficiency in soil-moisture delays the growth of sorghum, but does not permanently check it as in the case of maize. Provided a spell of cold weather does not ensue, a most vigorous growth of sorghum takes place with the arrival of rain after a hot dry spell which would suffice to wither up maize completely. It retains succulence in stem and leaves for some time after attaining maturity or even after light early frosts, and this valuable characteristic is of no little service to the farmer who grows it, in enabling him to continue a supply of succulent feed into the early part of the winter.

Only the sweet or saccharine varieties of sorghums have any general utility in New Zealand, and the varieties of these on the local market are Early Amber Cane, Planter's Friend, and Sorghum Saccharatum. Amber Cane and Saccharatum are the varieties for late summer feed, as they reach full maturity as a rule in about four months from sowing. Both are fairly fine-stemmed, and if seeded fairly thick the surplus over forage requirements can be cured as hay, which provides an excellent, nutritious, and palatable chaff for either cattle or horses. Planter's Friend is a late variety of very slow growth at first. Usually a fortnight elapses before the braird is noticed, and for some weeks thereafter the growth is very small. The subsequent growth, however, is of astonishing rapidity. The plant is very drought-resistant, and also frost-resistant when mature.

The cultivation of sorghum is similar to that for maize. On a well-prepared surface the seed is either drilled in the usual way with a grain-drill, allowing the seed to pass through every fourth or fifth coulter, when from 5 lb. to 6 lb. of seed per acre are required; or, if the rainfall is good, the seed may be broadcasted at the rate of about 20 lb. per acre. Broadcast sorghum when not required for green feed may, as already indicated, be converted into excellent hay. The feeding of horses on sorghum chaff supplemented by an allowance of maize is not uncommon in New South Wales and Queensland, and in those States excellent results have been achieved in the fattening of steers in the same way.

### SUDAN GRASS.

Sudan grass, a member of the sorghum family, has recently acquired a good reputation as a summer forage. It was tested by

several farmers in the Auckland district last year, and the reports were not only encouraging but so enthusiastic as to warrant a recommendation for further general trials of this valuable forage. The following extract from the letter of a Manurewa correspondent, written at the end of April last, gives the grower's experience: "I sowed a patch of Sudan grass on the 30th October, 1915, and about a month afterwards started to cut some when about 15 in. high, and have cut it eight or nine times since, and am still cutting for pigs, who devour it in preference to anything else. I cut it for pigs when from 12 in. to 18 in. high. One part I cut only four times and then let it go to seed; some of this I made a little hay with. My horse and cows left oats for it, and any time I have given it to them they prefer it to anything else. It has fibrous roots like wheat or oats, is very leafy, and the more it is cut the more it stools. It has reached about 6 ft. 6 in. in my patch, which was sown after early potatoes. I gave no manure except what the potatoes had. On one plant I counted the stalks, and reached 140; but with those I allowed to seed I have some plants which will number about fifty stalks carrying seed, and in some cases I have noticed where I cut the seed-heads well up the plant has thrown some more seed-heads from the side of the stalk. The seed is a good fowl-grain."

Sudan grass is not only a rapid grower but is most drought-resistant. During the summer of 1913 the writer grew a crop of it at the Queensland Agricultural College. The condition of the soil with regard to moisture at the time of sowing was satisfactory, but no rain fell during the seven weeks which elapsed before the Sudan grass produced its seed-heads at a height of about 6 ft. and with great luxuriance of leaf. During this period the maize crops generally proved a complete failure, and even the more drought-resistant sorghums wilted badly. In fact, this crop of Sudan grass was the only green break in a parched and withered landscape. Part of the crop was cut off for cows, and although the weather continued dry the Sudan grass shot up afresh, providing a complete carpet of green feed for grazing. Its grazing-value during the height of the summer is very considerable. It is certain that a good stand of Sudan grass will bear repeated grazing.

Sudan-grass seed is procurable from Auckland seed-firms. Neither it nor any of the sorghums is recommended for growing south of the Waikato, except as a trial in good sheltered paddocks which have the advantage of reflected heat from surrounding hills. Sudan grass should be drilled through every coulter at the rate of 15 lb. per acre, or broadcast at the rate of 20 lb.

It should be noted that the view is put forward that none of the sorghum family are safe feeds for stock until they have run into seed-head, owing to their liability to develop prussic-acid poisoning. That this has sometimes happened is not to be doubted. The writer has, however, fed all kinds of stock repeatedly and indiscriminately on various sorghums without bad result, and is aware that this is generally done. The Ontario Agricultural College, in Canada, uses sorghum with oats and red clover as its standard summer pasture. Except when the crop has been unusually stunted in its growth from any cause, such as drought or cold, the danger of poisoning would appear to be infinitesimal.

### MILLET.

Among the same class of forage crops the millets occupy an important position as quick growers under warm, moist conditions. They are favourite catch-crops in districts with good summer rainfall in Australia. Japanese millet is grown to a greater or less extent throughout the North Island. Except for its rapidity of growth and suitability for ensilage this variety has no particular recommendation. The stalks are somewhat hard and coarse, and as mature fodder it is less palatable than any of the crops previously mentioned, while the same characteristics render it not very suitable for hay, although, as mentioned, it makes a good ensilage crop. It, however, stands grazing fairly well, and any one distrusting the sorghums on account of possible poisoning might try Japanese millet.

The common foxtail or Hungarian millet is much finer in the stem, and if cut just immediately after the seed-stem emerges it provides a hay crop which is not to be despised. It is necessary to cut with the mower and cure in the swathe, as the crop is too bulky and succulent to cure in sheaf when harvested by a self-binder. The best of all the millets, however, either for pasturing, green fodder, or hay, is the White panicum, characterized by white inflorescence and seed, which distinguish it from other varieties. White panicum is a great stooler, and is a first-class pasturing crop.

All the millets are seeded at about 12 lb. per acre if drilled, and 20 lb. if broadcast. They flourish under warm, moist conditions only, and are adversely affected by cold nights. They function chiefly as grazing, green feed, and hay crops in place of oats and other temperate cereals, which if sown under such conditions in summer would inevitably succumb to rust.

### OTHER FORAGE CROPS.

The warm-district leguminous forage crops, such as cow-peas and soya beans, have not hitherto proved generally successful in this country. A perennial forage crop which has provided a good stand-by at all times of the year in some of the Australian States is Indian or cow cane. A supply of cuttings of this crop has just been received by the Department from the Hawkesbury Agricultural College, and these are being grown at Ruakura, Tauranga, and other places in the North this year. If the result is favourable cuttings will be available for distribution later.

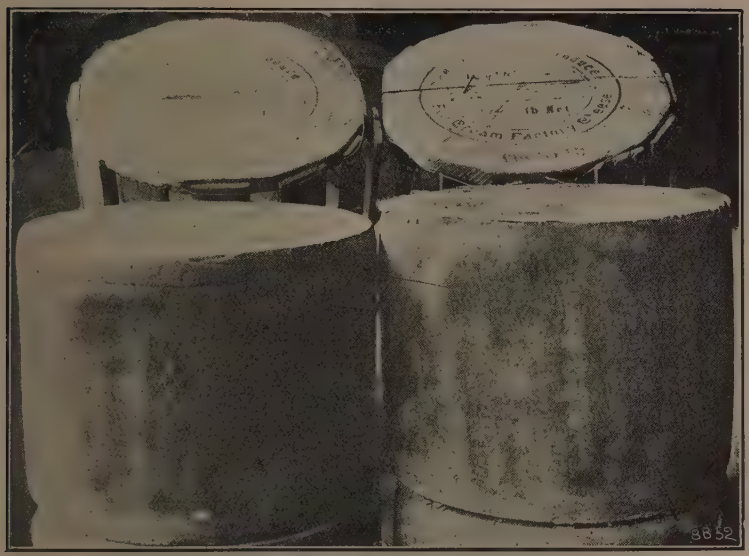
## SCALE-BOARDS IN CHEESE-PACKING.

D. CUDDIE, Director of the Dairy Division.

In most respects it can be said that the packing of New Zealand cheese for the Home market is quite satisfactory. This applies to the style and strength of the crates used for this purpose, and within recent years what may be described as a standard package has been adopted by the cheese companies. The branding, as a general rule, is also uniform, as well as being neat and attractive. In a certain respect, however, the packing of cheese at some of the factories is unsatisfactory, in that scale-boards are not used to protect the cheese from adhering to the ends and centre-boards of the crates. While by far the greatest part of the Dominion's cheese-production is packed with scale-boards in approved manner, some of the factories have not yet fallen into line.

The officers of the Dairy Division have persistently recommended the inclusion of scale-boards—one for each end of each cheese—to ensure safe carriage to the market; and, in view of the damage sustained and the losses incurred through neglect of this advice, it is surprising that some of the dairy companies have still neglected this important preventive method.

During the past season numerous complaints have been received through the Inspector of New Zealand Dairy-produce, in London, regarding the damage sustained through the wood of the crates adhering to the cheese. As force has to be applied to remove the wood, a portion of the product is invariably torn away, which gives the cheese a most unsightly appearance, to say nothing of the




CHEESE FROM A NORTH ISLAND FACTORY, PACKED WITH SCALE-BOARDS. CONDITION GOOD.

CHEESE FROM THE SAME FACTORY, PACKED WITHOUT SCALE-BOARDS. SHOWING DAMAGE DUE TO THE CHEESE ADHERING TO THE CASE-TIMBER.

CHEESE ON LEFT PACKED WITH SCALE-BOARDS. CHEESE ON RIGHT FROM SAME SHIPMENT, DAMAGED THROUGH NON-USE OF SCALE-BOARDS.

*[Photos taken in London.*

monetary loss which is thus incurred. We are informed that in some of the consignments shipped last season this loss amounted to 5s. per hundredweight of cheese. When it is known that scale-boards can be purchased for a fraction over one farthing each, and that only four are required for each crate—a total cost of, say, one penny—it is difficult to understand why any dairy company allows its cheese to leave New Zealand without this protection.

With a view to showing the extent to which cheese has been damaged through the non-use of scale-boards some photographs have been forwarded by Mr. W. Wright, the London Inspector, and are reproduced here, with explanatory notes. These illustrations demonstrate the necessity for the provision of scale-boards in all crates of cheese far better than any argument in their favour could do.

Not only should every dairy company making cheese in New Zealand insist upon the provision of scale-boards, but the managers should take particular pains to see that not a single crate of cheese leaves the factory without such protection. One rather common mistake is to make the cheese too large to permit the scale-boards to be slipped in at each end of the cheese, but the size of the latter should be so regulated to leave room for this purpose.

All progressive dairymen will agree that no fault in the packing of our cheese should be allowed to continue, because they recognize that faults of this nature are easy to remedy. Then, again, it should be remembered that damaged produce causes great annoyance to the trade, owing to the difficulty in disposing of it. Ordinary traders have no sale for damaged goods, and thus do not want them. Direct representations on these lines have been made in the quarters where most needed, and it is hoped that no cheese will leave New Zealand for the Home market during the coming season without being protected against damage and loss by the use of scale-boards.

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At the Department's Albany experimental area, situated on the Waitemata gumlands, the John Bull swede gave the best results among the varieties tested last season. In general, swedes have done better than turnips on the plots. Rape did splendidly where the ground had been heavily limed the previous year, but was a complete failure on a piece of land that had been left unlimed. Among the kales the Giant Early Field variety was a striking success, throwing a great bulk of forage. Of the lucerne varieties, Colonial, Hunter River, Arabian, Peruvian, Salt Lake City, Grimms, and Dryland have maintained a fairly even growth through the summer and winter, while American, Turkestan, Hungarian, French, and Russian were more or less dormant in the winter.

# SEED-IMPURITIES.

A. H. COCKAYNE, Biologist.

PRINTED below is a statement of extraneous seeds found in commercial samples of agricultural seed on the New Zealand market, showing, by means of a key, the relative frequency of occurrence of each, and whether harmful or otherwise. The list is based on the results of some thousands of purity analyses of seeds made in the Biological Laboratory during the past four years. The list is now printed on the back of the report forms issued under the Department's seed-testing system, and affords a useful and handy reference for the person to whom the report is furnished, enabling him to estimate the importance or otherwise of the impurities specified by weight and numbers per cent. in the report. In many cases, even in comparatively well-cleaned lines of seed, the number of different extraneous seeds specified appears rather formidable, and to the uninitiated the sample might seem quite unsuitable for sowing. A reference to the table, however, will put the matter in its practical proportions. Unless the seed is required for some very special purpose the majority of extraneous seeds in a sample are not a matter of much consequence, although the presence of any one in large numbers would, of course, be a drawback. On the other hand, the really dangerous or troublesome impurities the inclusion of which should not be tolerated are clearly indicated in the list, and it is for the persons concerned to act on the information given.

KEY.

EC = Extremely common.
VC = Very common.
C = Common.
RC = Rather common.
RR = Rather rare.
R = Rare.
VR = Very rare.
ER = Extremely rare.
(*a*) = Dangerous.
(*b*) = Dangerous (except on well-stocked sheep-country).
(*c*) = Troublesome.
(*d*) = Not troublesome.
(*e*) = Weed of pasture.
(*f*) = Weed of arable land and temporary crop.
(*g*) = Weed of waste places, roadsides, stockyards, &c.
(*h*) = A small percentage in a line of little moment.
(*i*) = Useful seed.
(*j*) = Found mainly in imported seed.
(*k*) = Found only in New-Zealand-grown seed.
(*l*) = Indicator European lucerne.
(*m*) = Indicator Asiatic lucerne.
(*n*) = Indicator American meadow-fescue.
(*o*) = Plant not yet recorded in New Zealand.
(*p*) = Weed in damp pastures.
(*q*) = Sometimes used as an adulterant.
(*r*) = Sclerotium of a fungus said to be injurious to stock.
(*s*) = Troublesome in arable land.
(*t*) = Troublesome in permanent pasture.
(*u*) = Occasionally sown under special conditions.
(*v*) = Harmful to wool.

LIST OF EXTRANEOUS SEEDS FOUND IN COMMERCIAL SAMPLES OF SEED ON THE NEW ZEALAND MARKET, SHOWING RELATIVE FREQUENCY OF OCCURRENCE OF EACH, AND WHETHER HARMFUL OR OTHERWISE.

Alsike (*Trifolium hybridum*) C (*i*, *h*).
American cress (*Barbarea praecox*) RR (*j*, *g*, *d*, *p*, *h*).
Annual knaul-grass (*Scleranthus annuus*) ER (*g*, *d*, *j*, *h*).
Annual meadow-grass (*Poa annua*) VC (*g*, *e*, *d*, *h*).
Asiatic star-thistle (*Centaurea picris*) R (*m*, *h*, *o*).
Australian flax (*Linum marginale*), RC (*g*, *e*, *d*, *h*).
Austrian chamomile (*Anthemis austriaca*) VR (*j*, *g*, *o*, *h*).
Axeweed (*Coronilla varia*) VR (*j*, *d*, *h*).
Barley-grass (*Hordeum murinum*) VR (*g*, *d*, *v*, *h*).
Barnyard-grass (*Panicum crus-galli*) VR (*g*, *f*, *s*, *h*).
Bathurst burr (*Xanthium spinosum*) VR (*e*, *c*, *v*).
Blackberry (*Rubus fruticosus*) ER (*g*, *e*, *c*).
Black-eyed susan (*Rudbeckia hirta*) R (*j*, *d*, *h*, *o*).
Black mustard (*Brassica nigra*) R (*f*, *c*).
Black nightshade (*Solanum nigrum*) RR (*g*, *f*, *s*, *h*).
Bladder-campion (*Silene inflata*) C (*g*, *e*, *d*, *j*, *h*).
Bindweed (*Polygonum convolvulus*) RR (*f*, *c*).
Birdsfoot trefoil (*Lotus corniculatus*) C (*i*, *h*).
Bokhara clover (*Melilotus officinalis*) RR (*i*, *h*).
Bracted plantain (*Plantago aristata*) C (*n*, *o*, *h*).
Broad-leaved dock (*Rumex obtusifolius*) VC (*g*, *f*, *p*, *c*).
Burdock (*Arctium Lappa*) VR (*g*, *e*, *d*, *v*).
Californian stinkweed (*Gilia squarrosa*) ER (*j*, *g*, *e*, *c*).
Californian thistle (*Carduus arvensis*) RC (*a*).
Canadian blue-grass (*Poa compressa*) RC (*j*, *d*, *q*).
Canary-grass (*Phalaris canariensis*) C (*g*, *f*, *d*, *h*).
Capeweed (*Cryptostemma calendulaceum*) ER (*g*, *e*, *c*).
Catchfly (*Silene anglica*) VC (*g*, *f*, *s*, *h*).
Catmint (*Nepeta cataria*) RR (*j*, *g*, *d*, *h*).
Catsear (*Hypochaeris radicata*) EC (*e*, *d*, *h*).
Celery (*Apium graveolens*) VR (*g*, *d*, *h*).
Celery-leaved buttercup (*Ranunculus sceleratus*) R (*g*, *s*, *p*, *d*, *l*)
Charlock (*Brassica arvensis*) VR (*f*, *c*).
Cheat (*Bromus secalinus*) RC (*g*, *f*, *d*, *j*, *h*).
Chewings fescue (*Festuca sabulicola*) R (*i*, *h*).
Chickweed (*Stellaria media*) VC (*g*, *f*, *e*, *s*, *h*).
Chicory (*Cichorium Intybus*) VC (*g*, *d*, *i*, *h*, *u*).
Cinquefoil (*Potentilla norvegica*) C (*j*, *e*, *d*, *h*).
Cleavers (*Galium aparine*) C (*g*, *s*, *f*, *h*).
Clustered clover (*Trifolium glomeratum*) RC (*e*, *q*).
Cocksfoot (*Dactylis glomerata*) EC (*i*, *h*).
Common daisy (*Bellis perennis*) VR (*e*, *c*).
Cornflower (*Centaurea cyanus*) R (*g*, *d*, *j*, *h*).
Creeping-buttercup (*Ranunculus repens*) C (*e*, *c*).
Creeping-fog (*Holcus mollis*) R (*e*, *f*, *s*).
Crested dogstail (*Cynosurus cristatus*) EC (*i*, *h*).
Crimson clover (*Trifolium incarnatum*) C (*i*, *h*).
Curled dock (*Rumex crispus*) VC (*g*, *f*, *c*).
Cutleaved cranesbill (*Geranium dissectum*) C (*g*, *f*, *e*, *d*, *h*).
Dandelion (*Taraxacum officinale*) VR (*g*, *e*, *f*, *d*, *h*).
Darnel (*Lolium temulentum*) ER (*f*, *c*).
Dodder (*Cuscuta* spp.) C (*a*).
English hair-grass (*Aira praecox*) C (*g*, *f*, *d*, *h*).
English trefoil (*Medicago lupulina*) C (*i*, *q*, *h*).
Ergot (*Claviceps purpurea*) VC (*r*).

Evening primrose (*Oenothera biennis*) VR (*g, d, j, h*).
False flax (*Camelina microcarpa*) VR (*g, d, j, h*).
Fat-hen (*Chenopodium album*) VC (*f, c*).
Fennel (*Foeniculum vulgare*) VR (*g, c*).
Fiddle-dock (*Rumex pulcher*) R (*g, c*).
Field-buttercup (*Ranunculus acris*) RC (*e, c*).
Field-chamomile (*Anthemis arvensis*) VC (*j, f, g, d, h*).
Field-cress (*Lepidium campestre*) VR (*g, e, j, s, h*).
Field-gromwell (*Lithospermum arvense*) VR (*f, g, d, h*).
Field-madder (*Sherardia arvensis*) VC (*f, g, e, d, h*).
Field-rush (*Luzula campestris*) R (*g, d, h, p*).
Fiorin (*Agrostis* spp.) C (*i, h*).
Forget-me-not (*Myosotis arvensis*) VC (*f, g, d, h*).
Four-seeded vetch (*Vicia gemella*) R (*g, d, h*).
Foxglove (*Digitalis purpurea*) ER (*g, e, c*).
Fumitory (*Fumaria muralis*) ER (*f, s, h*).
German millet (*Setaria italica germanica*) VR (*j, o*).
Goat's-rue (*Galega officinalis*) ER (*e, c*).
Golden pigeon-grass (*Setaria glauca*) R (*j, f, d, h*).
Goose-grass (*Bromus hordeaceus*) EC (*f, g, e, d, h*).
Greater birdsfoot trefoil (*Lotus major*) C (*i, h*).
Greater plantain (*Plantago major*) C (*g, e, p, d, h*).
Green pigeon-grass (*Setaria viridis*) C (*f, c, h*).
Groundsel (*Senecio vulgaris*) VR (*g, d, h*).
Hair-grass (*Festuca bromoides*) EC (*f, g, e, d, h*).
Hairy birdsfoot trefoil (*Lotus hispidus*) RC (*i, h*).
Hairy buttercup (*Ranunculus sardous*) C (*e, c*).
Hard fescue (*Festuca duriuscula*) C (*i, h*).
Haresfoot trefoil (*Trifolium arvense*) VR (*g, e, d, h*).
Hawkbit (*Leontodon hirtus*) VC (*g, e, d, h*).
Hawkweed (*Crepis capillaris*) EC (*g, f, e, d, h*).
Hedge-bedstraw (*Galium Mollugo*) R (*j, e, d, h*).
Hedge-parsley (*Torilis nodosa*) VR (*j, g, d, h*).
Hemlock (*Conium maculatum*) ER (*g, c*).
Hemp-nettle (*Galeopsis Tetrahit*) VR (*g, d, h*).
Hop-trefoil (*Trifolium procumbens*) C (*e, g, d, h*).
Hungarian forage-grass (*Bromus inermis*) VR (*i, h*).
Inkweed (*Phytolacca octandra*) ER (*g, e, c*).
Italian rye-grass (*Lolium italicum*) EC (*i, h*).
Knee-jointed foxtail (*Alopecurus geniculatus*) C (*e, g, p, d, h*).
Lamb's lettuce (*Valerianella Morisonii*) VR (*j, d, g, h*).
Lamb's succory (*Arnoseris pusilla*) VR (*j, e, d, h*).
Large-leaved plantain (*Plantago hirtella*) RR (*g, e, d, h*).
Large-seeded danthonia (*Danthonia pilosa*) C (*k, i, h*).
Lesser bindweed (*Convolvulus arvensis*) VR (*f, c*).
Linseed (*Linum usitatissimum*) C (*i, f, d, h*).
Lucerne (*Medicago sativa*) C (*i, h*).
Mallow (*Malva* spp.) RC (*g, d, h*).
Mayweed (*Matricaria inodora*) RC (*g, e, d, h*).
Meadow-fescue (*Festuca pratensis*) VR (*i, h*).
Meadow-foxtail (*Alopecurus pratensis*) RC (*i, h*).
Mediterranean rocket (*Eruca sativa*) R (*l, d, h*).
Milk-thistle (*Carduus marianus*) ER (*g, e, c*).
Milkweed (*Euphorbia peplus*) ER (*g, f, d, h*).
Millet (*Panicum miliaceum*) R (*j, f, d, h*).
Mouse-eared chickweed (*Cerastium vulgatum*) VC (*f, g, d, h*).
Mullein (*Verbascum Blattaria*) R (*g, e, d, h*).
Narrow-leaved cress (*Lepidium ruderale*) C (*g, e, f, s, h*).
Nettle-leaved vervain (*Verbena urticifolia*) R (*g, j, d, h*).
New Zealand rice-grass (*Microlaena stipoides*) RR (*k, i, h*).
New Zealand wind-grass (*Aira spicaventi*) RC (*k, f, e, d, h*).
Night-flowering catchfly (*Silene noctiflora*) C (*g, d, h*).
Nipplewort (*Lapsana communis*) VC (*g, f, d, h*).
Nodding-thistle (*Carduus nutans*) ER (*e, g, c*).
Oat (*Avena sativa*) R (*f, i, d, h*).
Orache (*Atriplex* spp.) VR (*f, g, d, h*).

Ox-eye daisy (*Chrysanthemum leucanthemum*) C (*e, b*).
Ox-tongue (*Picris echioides*) C (*g, e, d, h*).
Pale persicaria (*Polygonum lapathifolium*) VR (*f, p, d, h*).
Pansy (*Viola* spp.) RC (*g, d, h*).
Paspalum (*Paspalum dilatatum*) VR (*i, h*).
Pennyroyal (*Mentha Pulegium*) VR (*g, e, c, p*).
Pepper-grass (*Lepidium intermedium*) RC (*g, d, h*).
Perennial rye-grass (*Lolium perenne*) EC (*i, h*).
Pigweed (*Amaranthus retroflexus*) R (*f, s, h*).
Poppy (*Papaver* spp.) RR (*g, f, d, h*).
Prairie-grass (*Bromus unioloides*) R (*i, h*).
Prickly sowthistle (*Sonchus asper*) C (*f, g, d, h*).
Ragwort (*Senecio Jacobaea*) RR (*e, g, b*).
Ratstail (*Sporobolus indicus*) R (*i, h*).
Rayless chamomile (*Matricaria discoidea*) VR (*g, d, h*).
Red clover (*Trifolium pratense*) VC (*i, h*).
Red fescue (*Festuca rubra*) C (*i, h*).
Red tarweed (*Odontites rubra*) R (*j, s, h*).
Reed canary-grass (*Phalaris arundinacea*) VR (*e, p, u*).
Rib-grass (*Plantago lanceolata*) EC (*e, g, d, u, h*).
Rough-stalked meadow-grass (*Poa trivialis*) C (*i, h*).
Rugel's plantain (*Plantago Rugeli*) C (*j, g, o, d, h*).
Sainfoin (*Onobrychis sativa*) RR (*i, h*).
St. John's wort (*Hypericum perforatum*) RR (*e, g, c*).
Salsify (*Tragopogon porrifolius*) R (*g, d, h*).
Sand-clover (*Anthyllis vulnevaria*) R (*i, h*).
Sandwort (*Arenaria serpyllifolia*) VR (*g, j, d, h*).
Scarlet pimpernel (*Anagallis arvensis*) VC (*g, f, d, h*).
Sedge (*Carex cephalophora*) C (*j, h*).
Selfheal (*Prunella vulgaris*) VC (*g, e, t, h*).
Serradella (*Ornithopus sativus*) R (*j, i, d, h*).
Shepherd's purse (*Capsella bursa-pastoris*) VC (*f, c*).
Sheep's burnet (*Poterium Sanguisorba*) R (*i, h*).
Sheep's burr (*Acaena ovina*) R (*e, c, v*).
Sheep's fescue (*Festuca ovina*) R (*i, h*).
Shore-plantain (*Plantago Coronopus*) R (*g, d, h*).
Slender birdsfoot trefoil (*Lotus angustissimus*) C (*i, h*).
Slender rush (*Juncus tenuis*) RC (*e, d, h*).
Small-flowered buttercup (*Ranunculus parviflorus*) C (*g, f, c*).
Small-flowered cranesbill (*Geranium pusillum*) RC (*j, o, d, h*).
Small-seeded danthonia (*Danthonia semiannularis*) C (*k, i, h*).
Smart-weed (*Polygonum Persicaria*) RC (*f, c*).
Smooth-stalked meadow-grass (*Poa pratensis*) VC (*i, f, s*).
Soft-leaved cranesbill (*Geranium molle*) VC (*e, g, d, h*).
Soldier's button (*Cotula coronopifolia*) VR (*k, g, p, d, h*).
Sorghum (*Sorghum vulgare*) R (*j, d, h*).
Sorrel (*Rumex acetosella*) EC (*g, e, f, c*).
Sour dock (*Rumex acetosa*) C (*j, e, g, d, h*).
Sowthistle (*Sonchus oleraceus*) C (*g, d, h*).
Spear-thistle (*Carduus lanceolatus*) C (*e, g, c*).
Spotted burr clover (*Medicago maculata*) R (*g, c, v*).
Spurrey (*Spergula arvensis*) VC (*f, c*).
Sterile brome-grass (*Bromus sterilis*) RC (*g, d, h*).
Stinging-nettle (*Urtica dioica*) VR (*g, h*).
Stinking-chamomile (*Anthemis cotula*) C (*j, g, e, f, d, h*).
Stinkweed (*Thlaspi arvense*) R (*j, f, s*).
Stitchwort (*Stellaria graminea*) RC (*j, e, d, h*).
Storksbill (*Erodium cicutarium*) R (*g, e, f, s*).
Strawberry-clover (*Trifolium fragiferum*) R (*i, h*).
Subterranean clover (*Trifolium subterraneum*) R (*i, h*).
Suckling-clover (*Trifolium minus*) EC (*f, e, u, d, h*).
Sweet alyssum (*Alyssum alyssoides*) R (*j, g, d, h*).
Sweetbriar (*Rosa rubiginosa*) ER (*g, e, c*).
Sweet floating-grass (*Glyceria fluitans*) R (*g, p, d, h*).
Sweet vernal (*Anthoxanthum odoratum*) VC (*e, g, t, h, u*).
Tall fescue (*Festuca arundinacea*) C (*p, c, u*).

Tall oat-grass (*Arrhenatherum avenaceum*) RR (*i, h*).
Tarweed (*Bartsia viscosa*) VR (*e, c*).
Thompson's bent-grass (*Triodia Thompsoni*) RR (*k, e, d, h*).
Timothy (*Phleum pratense*) VC (*i, h*).
Toad-flax (*Linaria vulgaris*) VR (*j, d, f, s, h*).
Toad-rush (*Juncus bufonius*) RC (*g, p, d, h*).
Toothed burr-clover (*Medicago denticulata*) R (*g, c, v*).
Treacle-mustard (*Erysimum cheiranthoides*) RR (*j, g, f, d, h*).
Tufted hair-grass (*Aira caespitosa*) C (*g, d, h*).
Tutsan (*Hypericum Androsaemum*) ER (*g, c*).
Twitch (*Agropyron repens*) VR (*e, f, s*).
Veronica (*Veronica* spp.) RC (*f, d, h*).
Vervain (*Verbena officinalis*) RR (*g, d, h*).
Vetch (*Vicia sativa*) RC (*g, f, d, h*).
Vipers bugloss (*Echium vulgare*) VR (*g, e, t, h*).
Virginian cress (*Lepidium virginicum*) RC (*j, d, h*).
Wart-cress (*Senebiera didyma*) VR (*g, f, s, h*).
Western Wolths rye-grass (*Lolium westwolticum*) (*i, h*).
Wheat (*Triticum vulgare*) RR (*i, h*).
White clover (*Trifolium repens*) VC (*i, h*).
White mustard (*Brassica alba*) RR (*i, h*).
Wild carrot (*Daucus carota*) RC (*g, f, d, h*).
Wild beaked parsley (*Anthriscus silvestris*) RR (*j, g, d, h*).
Wild lettuce (*Lactuca* spp.) VR (*g, d, h*).
Wild melilot (*Melilotus arvensis*) RC (*g, d, h*).
Wild mignonette (*Reseda luteola*) R (*j, g, d, h*).
Wild oat (*Avena fatua*) RR (*f, s, h*).
Wild turnip (*Brassica campestris*) RC (*f, s, h*).
Winged thistle (*Carduus pycnocephalus*) RR (*e, c*).
Wireweed (*Polygonum aviculare*) C (*g, f, c*).
Witch-grass (*Panicum capillare*) RR (*f, d, h*).
Wood meadow-grass (*Poa nemoralis*) R (*i, h*).
Woolly-headed thistle (*Carduus eriophorus*) ER (*e, g, c*).
Woolly mullein (*Verbascum Thapsus*) VR (*g, e, d*).
Woundwort (*Stachys arvensis*) R (*f, d, h*).
Yarrow (*Achillea millefolium*) VC (*e, s, h, u*).
Yellow star-thistle (*Centaurea solstitialis*) R (*e, d, h*).
Yorkshire fog (*Holcus lanatus*) EC (*g, e, c, p, u*).

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## HEREDITARY TRANSMISSION OF EARMARKS.

A REMARKABLE case of transmission of earmarks by a bull to his progeny is reported by Mr. W. B. Hingston, Inspector of Stock, Gisborne. The animal in question, a purebred Jersey, was calved at Ruakura in 1911, and was earmarked with "tip off right ear." His progeny has been born marked as follows: Eight heifers (now two-year-olds) with tip off both ears, two heifers (now yearlings) with tip off right ear only, a calf (this season) with tip off both ears, and another calf whose ears are shown in the photograph on the opposite page. In this case, however, as will be noticed, the marks are in the nature of what is known as a "fork." The bull is owned by Mr. James Haskins, of Manutuke, near Gisborne.

EARS OF CALF BORN WITH MARKS SHOWN.

# CO-OPERATIVE EXPERIMENTS AT MATAMATA.

## MANURIAL AND ROOT-VARIETY TRIALS.

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THE experiments recorded below were conducted during last season by members of the Matamata branch of the Farmers' Union in co-operation with the Department of Agriculture. The following took active part in the experiments: Messrs. J. McCaw, "The Tower," Matamata; J. W. Simpson, Matamata Flats; E. and A. Bowler, Peria; E. C. Banks, Matamata Flats; J. Cranswick, Matamata Flats. The experiments were under the supervision of Mr. G. de S. Baylis, Fields Instructor for the North Island, and it was due to his assistance and kindly criticism that many improvements were effected in laying out and operating the trials.

The soil of the Matamata Flats, where the experiments were carried out, is of a light and friable nature, and seems to be benefited by heavy rolling. It is all well drained, but very poor in lime, and to a fair extent poor also in organic matter. The soil on Messrs. E. and A. Bowler's farm at Peria is situated on higher land, and is of a somewhat heavier nature, but is still a friable loam. It will be noticed that all experiments were carried out on land that had previously been in pasture.

The rainfall for the season was not normal. The soil in every case was moist enough to germinate the seed, but the very dry weather which followed, accompanied by the cabbage-moth, checked the development of the crop. Following the very dry and exceptionally hot weather of January and February there were good autumn rains, but they were too late to be of much benefit at the time. By May some of the farmers reported that their swedes were going bad, and that they would soon be feeding-off. It was therefore decided to commence harvesting without delay, although in many cases the roots were not quite mature.

Particulars of the rainfall, as recorded by Mr. J. B. Starkey, of Kiwitahi, are as follows: 1915—June, 7·09 in.; July, 5·22 in.; August, 2·57 in.; September, 4·48 in.; October, 5·49 in.; November, 6·78 in.; December, 1·74 in.: 1916—January, 1·08 in.; February, 1·57 in.; March, 4·35 in.; April, 3·49 in.; May, 4·17 in.; June, 3·38 in.

The manurial experiments were laid out with the object of ascertaining the profit, and it became necessary to decide on a fair valuation of the crops, in this case swedes. At a representative gathering of about fifty farmers held at Matamata on 18th May it was decided that, owing to the unfavourable season and the consequent scarcity of swedes, the price should be fixed at 5s. per ton. Members gave instances of crops during the current season selling at 5s. and over per ton which in normal seasons would fetch little more than 2s. 6d. The Department of Agriculture fixed the prices of the manures at pre-war rates per hundredweight as follows: Superphosphate, 5s. 3d.; bonedust, 8s.; dried blood, 12s. 6d.; basic slag, 5s.; basic superphosphate, 5s.; guano, 4s. 9d.; sulphate of potash, 15s. 6d.

## MANURIAL TRIAL: SWEDES.—J. McCAW.

This experiment was laid out with the object of discovering the most profitable manure for swedes in the Matamata district. As past experience has proved that phosphatic manures must form the basis of any mixture used, it was decided that during the first year an attempt should be made to ascertain the relative value of the different phosphatic manures. This has been done partly in this experiment and partly in the phosphate and lime trials conducted on Mr. Simpson's farm. It was thought that information on this point would then form a basis from which in future years it should be possible to build up and compare mixed manures.

*Preparation of the Land.*—The land used was part of a worn-out pasture. It was skim-ploughed in June, 1915, and received a second ploughing in November, 1915. It was rolled and disked twice, tine-harrowed, rolled, and sown on 16th December, 1915. The cost of growing the crop (one acre), exclusive of manures, was as follows:—

| | £ | s. | d. |
|---|---|---|---|
| Two ploughings at 7s. 6d. .. .. .. | 0 | 15 | 0 |
| Three rollings at 1s. .. .. .. | 0 | 3 | 0 |
| Two diskings at 2s. .. .. .. .. | 0 | 4 | 0 |
| One harrowing .. .. .. .. | 0 | 1 | 6 |
| Drilling .. .. .. .. .. | 0 | 2 | 6 |
| Seed at 1s. per lb. .. .. .. .. | 0 | 0 | 9 |
| Rent .. .. .. .. .. | 1 | 0 | 0 |
| Total cost .. .. .. .. | £2 | 6 | 9 |

*Planting.*—One acre was devoted to the experiment, the area being divided into thirteen plots. Seed was sown on the flat at 11 oz. per acre, in drills 14 in. apart. The variety used for the trial was Elephant, which was being sown on the farm at the time. Seed and manure were not mixed together before sowing.

An attempt was made to sow all manures at the rate of 15s. worth per acre. Sand was mixed with the manures to make equal bulk in sowing, and to modify as much as possible the tendency of some manures

MANURIAL TRIAL: SWEDES.—J. McCAW.

| Order of Merit. | Manure, and Value intended to be applied per Acre. | Value of Manure actually applied. | Cost of producing Crop. | Total Cost per Acre. | Yield per Acre. | | | Value at 5s. per Ton. | Profit per Acre. | Loss per Acre. |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Tops. | Roots. | Total. | | | |
| | | s. d. | £ s. d. | £ s. d. | Tons cwt. | Tons cwt. | Tons cwt. | £ s. d. | £ s. d. | £ s. d. |
| 1 | Superphosphate, 7s. 6d.; basic slag, 7s. 6d. | 13 0 | 2 6 9 | 2 19 9 | 2 5 | 15 19 | 18 4 | 4 11 0 | 1 11 3 | .. |
| 2 | Superphosphate, 10s.; bonedust (3 per cent. nitrogen), 5s. | 12 9 | 2 6 9 | 2 19 6 | 1 10 | 15 18 | 17 8 | 4 7 0 | 1 7 6 | .. |
| 3 | Superphosphate, 12s.; dried blood (8 per cent. nitrogen), 3s. | 13 3 | 2 6 9 | 3 0 0 | 1 10 | 15 8 | 16 18 | 4 4 6 | 1 4 6 | .. |
| 4 | Basic superphosphate, 15s. .. .. | 12 3 | 2 6 9 | 2 19 0 | 0 3 | 14 13 | 15 16 | 3 19 0 | 1 0 0 | .. |
| 5 | Superphosphate, 15s. (average of four check plots) | 12 10 | 2 6 9 | 2 19 7 | 1 5 | 13 15 | 15 0 | 3 15 0 | 0 15 5 | .. |
| 6 | Superphosphate, 11s. 4d.; sulphate of potash, 3s. 8d. | 13 0 | 2 6 9 | 2 19 9 | 0 16 | 13 15 | 14 11 | 3 12 9 | 0 13 0 | .. |
| 7 | Basic slag, 15s. .. .. .. | 13 0 | 2 6 9 | 2 19 9 | 0 6 | 4 14 | 5 0 | 1 5 6 | .. | 1 14 9 |
| 8 | Basic slag, 9s. 9d.; bonedust, 5s. 3d. .. | 13 9 | 2 6 9 | 3 0 6 | 0 5 | 4 13 | 4 18 | 1 4 6 | .. | 1 16 0 |
| 9 | No manure .. .. .. .. | .. | 2 6 9 | 2 6 9 | .. | .. | .. | .. | .. | 2 6 9 |
| 10 | Bonedust, 15s. .. .. .. | 12 9 | 2 6 9 | 2 19 6 | 0 2 | 1 12 | 1 14 | 0 8 6 | .. | 2 11 0 |

to run too freely in the drill. In spite of this precaution the residues left in the drill after sowing each plot were not equal. Allowance was made for these residues, which accounts for the slight variations in value of manure applied to each plot.

*Harvesting.*—A definite proportion was harvested from each plot on 17th May, 1916. The swedes were topped and cleaned, and the tops and roots weighed separately.

*Results.*—The results can be seen in the accompanying table, by an examination of the profit and loss columns. Plot 2 in the experiment received 2 parts of superphosphate to 1 of bonedust, which is the manure most commonly used in the district. Plot 3 received superphosphate together with the same amount of nitrogen in the form of dried blood as was present in the "bones and superphosphate" of plot 2. The results would seem to indicate that the nitrogen in "bones and superphosphate" does play a part in the excellent results obtained from this mixture.

Basic slag and bonedust, either singly or mixed, have given the poorest results. On the other hand, superphosphate mixed with either of them has given the best results. This would seem to indicate that the crop requires both quickly and slowly available forms of phosphoric acid. It certainly indicates to a very marked degree, both in this experiment and in the phosphate and lime trials, that slowly available forms by themselves are not to be recommended. The no-manure plot gave no yield, though the germination on all the plots was excellent. The loss from this plot, it will be noticed, is less than that sustained by the bonedust plot, although the latter gave some yield. It was noticeable while harvesting that there were fewer rotten swedes on the plots receiving lime. The four check plots of superphosphate were probably worst in this respect.

PHOSPHATE AND LIME TRIALS: SWEDES.—J. W. SIMPSON.

The object of this experiment was to discover the most profitable lime and phosphate manure, and the one that could, if necessary, most conveniently replace basic slag. It was thought that the information thus gained, together with that obtained at the other manurial trials, would form a good groundwork upon which to build up mixtures for future trials.

*Preparation of the Land.*—The land used had previously been in grass for nine years. It received only one ploughing, during the first week of November, 1915, which was followed by two diskings. It was again disked three times early in December, chain-harrowed, and sown on 14th December, 1915. The cost was as follows:—

| | £ | s. | d. |
|---|---|---|---|
| One ploughing at 7s. 6d. | 0 | 7 | 6 |
| Five diskings at 2s. | 0 | 10 | 0 |
| One harrowing | 0 | 1 | 6 |
| Sowing | 0 | 2 | 6 |
| Seed | 0 | 0 | 9 |
| Rent | 1 | 0 | 0 |
| Total cost | £2 | 2 | 3 |

PHOSPHATE AND LIME TRIALS: SWEDES.—J. W. SIMPSON.

| Order of Merit. | Manure, and Value intended to be applied per Acre. | Value of Manure actually applied. | Cost of producing Crop. | Total Cost per Acre. | Yield per Acre. | | | Value at 5s. per Ton. | Profit per Acre. | Loss per Acre. |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Tops. | Roots. | Total. | | | |
| | | s. d. | £ s. d. | £ s. d. | Tons cwt. | Tons cwt. | Tons cwt. | £ s. d. | £ s. d. | £ s. d. |
| 1 | Superphosphate, burnt lime 15s. 10d. .. | 15 3 | 2 2 3 | 2 17 6 | 2 3 | 11 3 | 13 6 | 3 6 6 | 0 9 0 | .. |
| | Superphosphate, basic slag, 15s. .. | 16 0 | 2 2 3 | 2 18 3 | 1 16 | 11 10 | 13 6 | 3 6 6 | 0 8 3 | .. |
| 3 | Superphosphate, ground limestone, 15s. 10d. | 15 10 | 2 2 3 | 2 18 1 | 1 8 | 9 11 | 10 19 | 2 14 9 | .. | 0 3 4 |
| 4 | Superphosphate, guano, burnt lime, 15s. 10d. | 15 10 | 2 2 3 | 2 18 1 | 1 10 | 8 3 | 9 13 | 2 8 3 | .. | 0 9 10 |
| 5 | Superphosphate (average of two parts), 15s. | 15 0 | 2 2 3 | 2 17 3 | 1 4 | 7 18 | 9 2 | 2 5 6 | .. | 0 11 9 |
| 6 | Guano, basic slag, 15s. .. .. | 15 0 | 2 2 3 | 2 17 3 | 0 13 | 4 0 | 4 13 | 1 3 3 | .. | 1 14 0 |
| 7 | Guano, 15s. .. .. .. | 17 4 | 2 2 3 | 2 19 7 | 0 14 | 4 2 | 4 16 | 1 4 0 | .. | 1 15 7 |
| 8 | Guano, ground limestone, 15s. 10d. .. | 15 10 | 2 2 3 | 2 18 1 | 0 11 | 3 15 | 4 6 | 1 1 6 | .. | 1 16 7 |
| 9 | Guano, burnt limestone, 15s. 10d. .. | 15 10 | 2 2 3 | 2 18 1 | 0 9 | 2 14 | 3 3 | 0 15 9 | .. | 2 2 4 |
| 10 | Basic slag, 15s. .. .. .. | 17 0 | 2 2 3 | 2 19 3 | 0 9 | 2 14 | 3 3 | 0 15 9 | .. | 2 3 6 |

*Planting.*—The experiment covered 1 acre, which was divided into eleven plots. Seed (Crimson King) was sown on the flat at 9 oz. per acre, in drills 14 in. apart, and was not mixed with the manure.

It was intended to apply manure at the rate of 15s. worth per acre, the lime, where used, being charged extra at £2 per ton. It was thought that this price would also cover the cost of mixing. Where used, lime was added at the rate of 48 lb. per acre—approximately 15 per cent. of the mixture—at a cost of 10d. per acre. A small amount of sand was used in some cases to bring the mixtures up to equal bulk, and the residues left behind account for the difference between the amount actually applied and that originally intended.

*Harvesting.*—A definite proportion was harvested from each plot on 16th May, 1916. The swedes were topped and cleaned, and the tops and roots weighed separately.

*Results.*—The yields throughout were very poor, owing to disease and unfavourable weather. Taking, however, a proportional view of the results, we have the two mixtures superphosphate and burnt lime (basic super) and superphosphate and basic slag topping the list. The latter mixture came first in Mr. McCaw's trials, and there, as in this experiment, is demonstrated the unsuitability for this land of insoluble phosphatic manures used alone. It may be worth noting that the mixture "super-guano-lime" is an improvement on superphosphate alone, in spite of the bad results obtained from guano, which formed about half the mixture It is another indication of what was mentioned in connection with the preceding manurial trials, that a soluble and insoluble phosphate mixture is better than either of these forms when used singly.

## MANURE QUANTITY TRIAL: SWEDES.—J. W. SIMPSON.

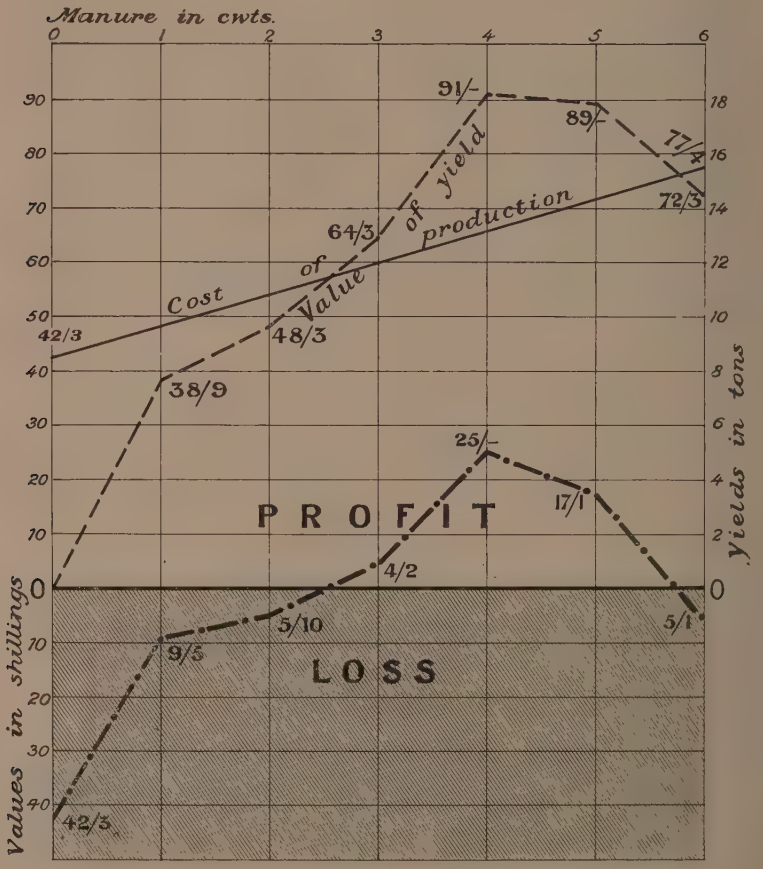
This experiment was laid out with the sole purpose of finding the most profitable amount of manure to use for swedes on the Matamata Flats. During this, the first trial, it was decided to use the most popular mixture in the district—viz., 1 part of bones to 3 of superphosphate. It was thought that when results were forthcoming from the manurial trials this experiment could be carried out with other mixtures which may prove themselves to be of value. The importance of such an experiment as this is obvious, since it is for the purpose of settling a point of great consequence to farmers. The experiment was carried out in the same paddock, and alongside of the phosphate and lime trials on Mr. Simpson's farm.

*Planting.*—The experiment covered half an acre, and consisted of seven plots. One plot received no manure, the others received amounts increasing by 1 cwt.—from 1 cwt. to 6 cwt. per acre. Unfortunately, the drill would not sow 6 cwt. per acre. It was therefore set at 3 cwt., and the plot in question was drilled twice with the manure There is little doubt that this was very much against the plot, and it would probably be fairer to exclude the 6 cwt. plot from our comparisons In sowing the 1 cwt. plot the drill was set at 2 cwt., but the mixture sown

was half sand and half manure. This may also have caused slight variation—if anything in favour of the plot.

*Other Factors.*—The cost of preparation of the land, the variety used, and the method of harvesting were the same as for the phosphate and lime trials.

*Results.*—The accompanying graph shows the cost of production, the line of yield, and the line of profit and loss. It might be mentioned that the proportion of profit from the use of manure will be influenced by the price. With swedes at a high price the proportional profit from manuring becomes greater. In other words, given high prices, one can profitably manure more heavily. The fixing of the price then becomes a matter of importance in an experiment of this type.




GRAPH SHOWING DATA OF MANURE-QUANTITY EXPERIMENT.

MANURE-QUANTITY TRIAL: SWEDES.—J. W. SIMPSON.

| Manure (1 of Bones to 2 of Super). | Cost per Acre. | Value of Manure. | Total Cost. | Yield. | Value at 5s. per Ton. | Profit. | Loss. |
|---|---|---|---|---|---|---|---|
| | £ s. d. | £ s. d. | £ s. d. | Tons cwt. | £ s. d. | £ s. d. | £ s. d. |
| No manure .. | 2 2 3 | .. | 2 2 3 | .. | .. | .. | 2 2 3 |
| 1 cwt. bones and super | 2 2 3 | 0 5 11 | 2 8 2 | 7 15 | 1 18 9 | .. | 0 9 5 |
| 2 cwt. bones and super | 2 2 3 | 0 11 10 | 2 14 1 | 9 13 | 2 8 3 | .. | 0 5 10 |
| 3 cwt. bones and super | 2 2 3 | 0 17 10 | 3 0 1 | 12 17 | 3 4 3 | 0 4 2 | .. |
| 4 cwt. bones and super | 2 2 3 | 1 3 9 | 3 6 0 | 18 4 | 4 11 0 | 1 5 0 | .. |
| 5 cwt. bones and super | 2 2 3 | 1 9 8 | 3 11 11 | 17 16 | 4 9 0 | 0 17 1 | .. |
| 6 cwt. bones and super | 2 2 3 | 1 15 1 | 3 17 4 | 14 9 | 3 12 3 | .. | 0 5 1 |

## VARIETY TRIALS.

Trials were conducted with swedes and soft turnips. The following tables show the yields per acre, also the percentage yields. Every fifth plot throughout the trials was a check plot. In spite of the fact that the land selected for the experiments appeared quite uniform there is rather marked variation in the check plots. For example, in Mr. Cranswick's trial, plots 3, 8, 13, and 18 were check plots, receiving the same treatment, and all sown with Garton's Superlative. The yields, however, gradually increased from plot 3 towards plot 18, as follows: 10 tons 18 cwt., 13 tons 15 cwt., 15 tons 18 cwt., 16 tons 9 cwt. We must therefore suppose that the yielding-power of the land gradually increases from plot 3 towards plot 18. It would then be unfair to compare a variety growing near plot 3 with one growing near plot 18. It is therefore necessary to take into account the varying nature of the land, as follows: If plot 3 yielded 10 tons 18 cwt. and plot 8 13 tons 15 cwt., it is reasonable to suppose that the increase was *gradual*, and this gradually increasing yielding-power is termed the " natural yield " of the land.

The following table shows in the second column the actual yields, and in the third the natural yields, of plots 3 to 8.

| No. of Plot. | Actual Yield. | Natural Yield. | Percentage Yields. |
|---|---|---|---|
| | Tons cwt. | Tons cwt. | |
| 3 (check) .. .. .. | 10 18 | 10 18 | 100 |
| 4 .. .. .. | 8 19 | 11 10 | 78 |
| 5 .. .. .. | 11 12 | 12 2 | 96 |
| 6 .. .. .. | 16 12 | 12 14 | 130 |
| 7 .. .. .. | 12 10 | 13 7 | 94 |
| 8 (check) .. .. .. | 13 15 | 13 15 | 100 |

If we give the value 100 to the check plots it remains an easy matter to find out what percentage the actual yield is of the natural yield, thus :

$$\frac{\text{Actual yield}}{\text{Natural yield}} \times 100 = \text{Percentage yield.}$$

In comparing the varieties it is manifestly unfair to compare the actual yields. The percentage yield forms the only fair basis for comparison.

VARIETY TRIAL : SWEDES.—J. CRANSWICK.

Check plots sown with Garton's Superlative.

Seed at 9 oz. per acre.

Manure : 1 of bones to 3 of superphosphate at 3 cwt. per acre.

Sown 15th December, 1915 ; harvested 15th May, 1916.

Previous history of the land : Ploughed out of grass in March, 1915, sown with Western Wolths grass, and grazed till November. Ploughed the middle of November, rolled on the furrows, disked twice, rolled again, and drag-harrowed twice.

| Plot. | Variety. | Germination. | Yield. | Percentage Yield. |
|---|---|---|---|---|
| | | Per Cent. | Tons cwt. | |
| 1 | Elephant .. .. .. .. | .. | 11 19 | 124 |
| 2 | John Bull .. .. .. .. | 66 | 13 8 | 130 |
| 3 | Garton's Superlative (check) .. .. | 96 | 10 18 | 100 |
| 4 | Sharpe's Ne Plus Ultra .. .. | 86 | 8 19 | 78 |
| 5 | Sharpe's Purple-top .. .. | 60 | 11 12 | 96 |
| 6 | Sharpe's Paragon .. .. .. | 90 | 16 12 | 130 |
| 7 | Sharpe's Coronation Green-top .. | 82 | 12 10 | 94 |
| 8 | Garton's Superlative (check) .. .. | 96 | 13 15 | 100 |
| 9 | Garton's Pioneer Turnip Swede .. | 96 | 11 9 | 80 |
| 10 | Garton's Incomparable .. .. | 96 | 14 2 | 96 |
| 11 | Garton's Keep Well .. .. .. | 82 | 14 6 | 95 |
| 12 | Garton's Monarch .. .. .. | 98 | 11 5 | 73 |
| 13 | Garton's Superlative (check) .. .. | 96 | 15 18 | 100 |
| 14 | Sutton's Magnum Bonum .. .. | 50 | 11 19 | 75 |
| 15 | Sutton's Champion .. .. .. | 74 | 12 6 | 78 |
| 16 | Sutton's Up-to-Date .. .. .. | 82 | 15 7 | 95 |
| 17 | Hurst's Monarch .. .. .. | 98 | 19 13 | 120 |
| 18 | Garton's Superlative (check) .. .. | 96 | 16 9 | 100 |
| 19 | Hurst's Champion .. .. .. | 82 | 9 13 | 58 |
| 20 | Crimson King .. .. .. | 82 | 15 4 | 91 |

VARIETY TRIAL : SWEDES.—E. AND A. BOWLER.

Check plots : Elephant.

Seed at 15 oz. per acre.

Manure : 1 part of bones to 3 of superphosphate at 3 cwt. per acre.

Sown 13th December, 1915 ; harvested 15th May, 1916.

Previous history of the land : Ploughed out of grass in July, 1915, and twice tine-harrowed during August. Ploughed 6 in. deep in November and sown.

| Plot. | Variety. | Germination. | Yield per Acre. | | Percentage Yield. |
|---|---|---|---|---|---|
| | | Per Cent. | Tons | cwt. | |
| 1 | Hurst's Monarch .. .. .. | 98 | 22 | 3 | 131 |
| 2 | Hurst's Champion .. .. .. | 82 | 24 | 9 | 136 |
| 3 | Elephant (check) .. .. .. | .. | 18 | 19 | 100 |
| 4 | Sharpe's Ne Plus Ultra .. .. | 86 | 22 | 10 | 113 |
| 5 | Sharpe's Coronation Green-top .. | 82 | 18 | 11 | 88 |
| 6 | Sharpe's A1 Purple-top .. .. | 60 | 21 | 1 | 96 |
| 7 | Sharpe's Paragon .. .. .. | 90 | 22 | 10 | 97 |
| 8 | Elephant (check) .. .. .. | .. | 24 | 3 | 100 |
| 9 | Garton's Monarch .. .. .. | 98 | 22 | 14 | 97 |
| 10 | Garton's Superlative .. .. | 86 | 24 | 9 | 108 |
| 11 | Garton's Keep Well .. .. .. | 82 | 24 | 2 | 110 |
| 12 | Garton's Pioneer Turnip Swede .. | 96 | 19 | 5 | 91 |
| 13 | Elephant (check) .. .. .. | .. | 20 | 11 | 100 |
| 14 | Garton's Incomparable .. .. | 96 | 20 | 7 | 100 |
| 15 | Sutton's Champion .. .. .. | 74 | 18 | 11 | 93 |
| 16 | Sutton's Magnum Bonum .. .. | 50 | 22 | 3 | 111 |
| 17 | Sutton's Up-to-Date .. .. .. | 82 | 18 | 11 | 95 |
| 18 | Elephant (check) .. .. .. | .. | 19 | 10 | 100 |
| 19 | Crimson King .. .. .. | 82 | 15 | 11 | 81 |
| 20 | John Bull .. .. .. .. | 66 | 18 | 15 | 98 |

VARIETY TRIAL: SOFT TURNIPS.—E. C. BANKS.

Check plots: Imperial Green Globe.

Seed at 9 oz. per acre. Seed and manure mixed.

Manure: 1 part of bones to 3 of superphosphate at 3 cwt. per acre.

Sown 21st January, 1916; harvested 14th May, 1916.

Previous history of land: Grass for nine years. Ploughed November, 1915; disked five times, and tine-harrowed twice.

| Plot. | Variety. | Yield per Acre. | | Percentage Yield. |
|---|---|---|---|---|
| | | Tons | cwt. | |
| 1 | Sutton's All the Year Round .. .. .. | 8 | 8 | 82 |
| 2 | Sutton's Purple-top Aberdeen .. .. .. | 5 | 18 | 58 |
| 3 | Imperial Green Globe (check) .. .. .. | 10 | 3 | 100 |
| 4 | Sutton's Favourite Purple-top .. .. .. | 5 | 7 | 53 |
| 5 | Sutton's Early Sheep-fold .. .. .. | 8 | 11 | 84 |
| 6 | Sutton's Purple-top Mammoth .. .. .. | 12 | 10 | 123 |
| 7 | Sutton's Green-top Six Weeks .. .. .. | 15 | 0 | 147 |
| 8 | Imperial Green Globe (check) .. .. .. | 10 | 3 | 100 |
| 9 | Sutton's Perfection .. .. .. .. | 5 | 7 | 53 |
| 10 | Sutton's Paragon .. .. .. .. | 11 | 12 | 116 |
| 11 | Sutton's Green-top Aberdeen .. .. .. | 3 | 15 | 39 |
| 12 | Sutton's Early Six Weeks .. .. .. | 8 | 7 | 86 |
| 13 | Imperial Green Globe (check) .. .. .. | 9 | 13 | 100 |
| 14 | Garton's Hardy Green Globe .. .. .. | 8 | 18 | 94 |
| 15 | Garton's Stobo-blue .. .. .. .. | 1 | 10 | 17 |
| 16 | Garton's Lincolnshire Red Globe .. .. | 8 | 15 | 94 |
| 17 | Sutton's Green Centenary .. .. .. | 4 | 6 | 46 |
| 18 | Imperial Green Globe (check) .. .. .. | 9 | 2 | 100 |
| 19 | Sutton's Pomeranian White Globe .. .. | 9 | 6 | 103 |
| 20 | Sharpe's Standard Green-top .. .. .. | 2 | 10 | 28 |

CONCLUDING NOTE.

In conclusion, it may be mentioned that the exceptionally unfavourable season reduced most of the yields to such an extent that it is still rather doubtful what results we might expect from the various manures in a normal season. Even in a normal season the results from one trial cannot be considered conclusive. They will undoubtedly require to be repeated three or four times, but at each trial some manure mixtures and some varieties can be thrown out.

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# RENNET-MAKING.

## SAVING OF CALVES' VELLS.

In connection with the steps taken recently by the producers' organizations to ensure future supplies of rennet for the cheesemaking industry, demonstrations of the approved method of saving calves' vells are being given by officers of the Live-stock Division throughout the dairying districts. The following description of the process, together with diagram, has been issued as a new edition of Bulletin No. 61, "Preparation of Calves' Vells for Rennet-making."

DIRECTIONS FOR SAVING THE VELL (AIR-DRYING METHOD).

The "vell" is the fourth or true stomach of the calf, and is used for the manufacture of rennet. Only the vells from sucking or milk-fed calves are valuable for this purpose. The vells of calves raised on grass or other solid foods are not suitable. Calves slaughtered for their vells should not be less than three or four days old.

When the calf is killed, immediately take out the vell, which in the young calf is the largest stomach of the four and connects directly with the bowel. The process is as follows:—

With the open carcase lying on its back, and the operator facing the head of the calf, first find the lower end of the vell where it connects with the bowel, over the liver. Then locate the two small stomachs ('book"* and "honeycomb"), which will be found close together attached to the upper end of the vell—the book on the left and the honeycomb a shade higher up on the right—as shown in the illustration on back page. These two stomachs will be empty and only slightly larger than a crown-piece. Now cut the bowel, leaving a few inches

* The "book" is better known in New Zealand as the "bible" or "manyplies."

attached to the vell; lift the vell towards the chest-cavity and cut it clear, leaving the book and honeycomb attached. When the vell has been thus secured, remove the few inches of bowel by cutting immediately above the junction between the stomach and the bowel, which feels like a hard knot close to the outlet from the vell. Then expel carefully the *whole* contents of the vell through the gut end by passing the vell a few times between the forefinger and thumb. Now

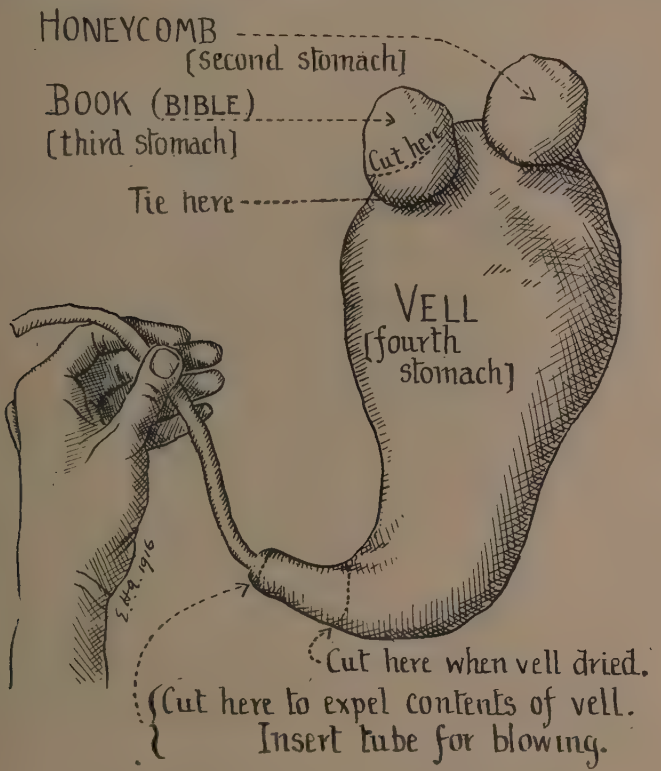


DIAGRAM INDICATING METHOD OF SAVING THE VELL.

remove the honeycomb and other adhering parts, leaving the book still attached. Tie a string tightly round the narrow neck between the vell and book, and then cut away the latter, leaving only sufficient of it to prevent the string from slipping. Insert a tube in the gut end, blow up the vell fairly hard like a bladder, and tie securely. Remove any adhering fat and tissue, taking care not to dress too close to the vell, as by doing so it may be weakened sufficiently to permit the escape of the air, in which case the vell would be rendered useless.

Hang the inflated vells in a draughty shed or a warm dry room, but do not expose them to more heat than that of an ordinary warm room. *Never hang vells in the open exposed to the sun.* Where a good draught can be created it will help to dry the vells quickly, and the process should not take more than a week. They should not be left moist long enough to mould or putrefy, and care should be taken that they are not infested with maggots or insects after being dried and bundled for despatch. In other words, they should be thoroughly dried and carefully protected from flies and other insects.

When a sufficient number of thoroughly dried vells have accumulated cut off the neck (which contains but little of the ferment) and let out the air; tie up the vells in bundles, and pack carefully for despatch to the collecting-depot or dairy factory as directed.

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## PARASITES IN SHEEP.

A. M. PATERSON, M.R.C.V.S., Veterinarian.

Most farmers have doubtless observed that foals harbouring lice became rapidly clean when given good nutritious food—no dressing or medicinal treatment of any kind being required. Exactly the same thing happens with sheep infested with internal parasites of various kinds. Good nourishing food given to sheep or lambs harbouring parasites in the form of worms will, in almost all cases, effect recovery. This is a clear indication that had the sheep or lambs been getting good food all along they would probably not have become the victims of intruding parasites, which seem to be always waiting to enter the bodies of animals whose vitality has been lowered by any cause.

The moral, then, is to keep up the vigour and vitality of the flocks by giving them a sufficiency of good, wholesome food all the year round. Sheep as a rule do well in the summer-time. They are then being fed wholly by nature. In the winter, however, when we have to make up nature's deficiencies, they do not always fare so well. It is then that we may discover that our system of management falls very far short of what it ought to be. Particular care should be taken not to confine sheep for lengthened periods to swampy areas which yield only indifferent feed. Nor should sheep be kept on good paddocks until

the feed has become so fouled that it is repellent to them. Overstocking, of course, leads to exactly the same results.

Of the many parasites that affect sheep only two—lung-worm and stomach-worm—will be touched upon in the present notes. In the early days lung-worm seems to have been looked upon as one of the chief causes of mortality in sheep in this country. One judges this to be the case from the fact that even to-day it is usually suspected by farmers in any outbreak of disease in a flock, especially if some of the sick sheep cough a little. But as a matter of fact this parasite is far less dangerous than the stomach-worm, and my experience is that improper feeding-conditions, followed by trouble set up by the stomach-worm, are responsible for enabling the lung-worms to multiply and cause their part of the trouble. It would be well if farmers could transfer that keenness they habitually exhibit towards the lung-worm and concentrate it on this other parasite, the stomach-worm; for it, and not the lung-worm, is the sheep's greatest enemy.

When sheep begin to show dullness and weakness accompanied by "black scour," if at the same time they are coughing, and one is inclined to think the cause of the trouble is lung-worm, even if the lung-worm has been seen coughed up from the lungs or sneezed from the nostrils of the affected sheep, the stomach-worm should be suspected. Let the farmer's energies be exerted in carrying out a line of treatment that will destroy or remove this parasite, and it will be exceptional if he does not get better results than he has usually obtained in treating such cases for lung-worm.

Assuming, then, that a flock is suspected of being affected with this stomach-worm, the first thing to do is to supply the sheep with some supplemental food. The best that can be given is crushed oats and bran, allowing about 5 oz. of the mixture for each animal. Having got the whole flock on to the food prescribed, the affected animals should now be treated medicinally. Lysol, given in the proportion of one teaspoonful (one dram) for every three lambs and the same quantity for every two sheep, is as good an agent as is likely to be at present available. To give lysol pure would be disastrous; to give it insufficiently diluted would be dangerous. Each dose must therefore be mixed with a suitable quantity of milk or water, but preferably milk; and about 6 oz. of the mixture is found in practice to be sufficient. The chemist who supplies the lysol might be asked to figure out the proportions for the number of sheep to be treated, so that there will be no risk of mistakes, accidents, or waste. One dose will, as a rule,

be sufficient, but in some cases two or more may be required. Allow a day to pass before repeating the dose.

All sheepowners should furnish themselves with a suitable drenching-flask for this kind of work. One of the best is made of tin, is shaped like a long-necked bottle, and has a capacity of about 8 oz., but a hole on one side prevents it holding more than 6 oz. When dipped into the vessel containing the drenching-mixture it is filled to the top, but on raising it perpendicularly all but the required amount pours out at the hole referred to. A finger or thumb is then placed on this hole and the dose administered in the usual way. In drenching sheep and lambs at the same time, two separate vessels must be used to hold the drenching-mixture—one for the sheep, the other for the lambs.

When drenching keep the sheep's head straight in line with the body, and do not tilt the head too high. If the head is raised too high the animal will not swallow readily, and in the endeavour to make it swallow it may be choked. If an operator will try to perform the act of swallowing with his own head thrown far back he will realize what is meant.

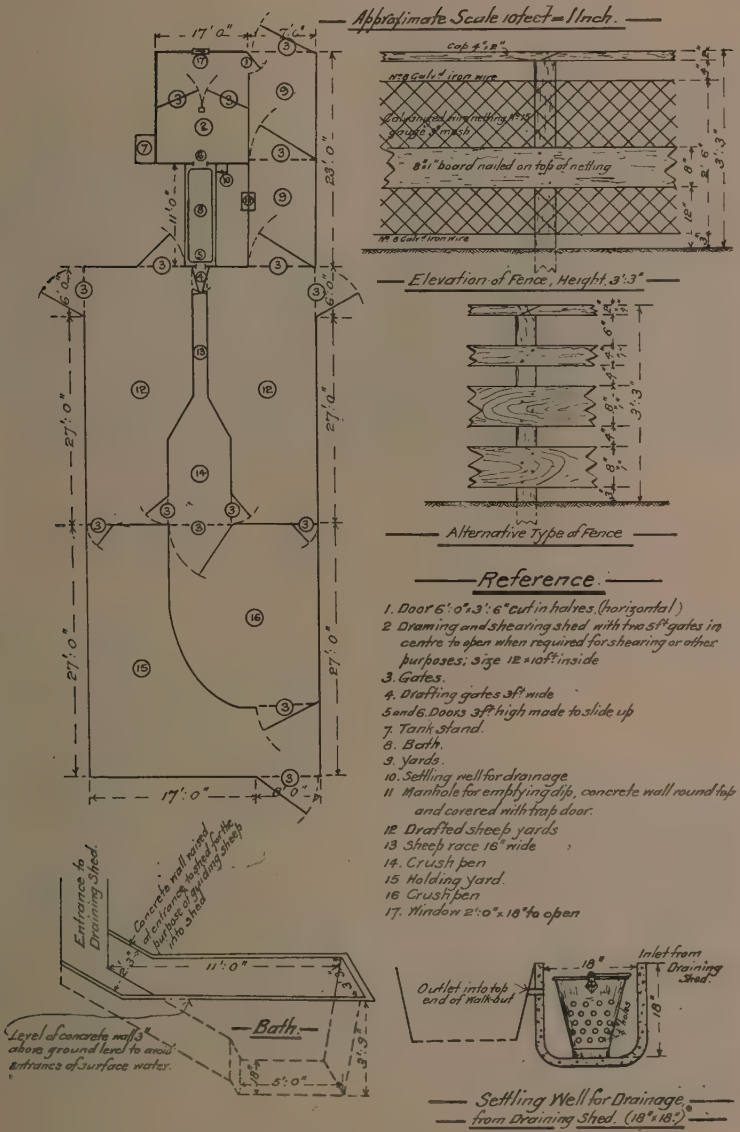
For fuller information on the subject of stomach-worms in sheep the reader is referred to the Department's New Series Bulletin No. 3, "Parasitic Gastritis of Sheep."

## A SMALL SHEEP DRAFTING, DIPPING, AND SHEARING PLANT.

THE plant, plans of which are given on the opposite page, has been designed to meet the requirements of owners of small flocks of sheep.

Details of the plant will be found in the reference table accompanying the plans, which are simple enough to be followed by the farmer. The shed may be constructed of any convenient material.

The dipping-bath, which will accommodate three or four sheep at a time, and holds about 350 gallons of wash, is only 11 ft. in length. Consequently it is necessary to hold each lot of sheep in the bath for the time necessary to secure thorough immersion. This may be done either by use of the crutch or by providing a check-gate in the bath about 4 ft. from the exit.


Approximate Scale 10 feet = 1 Inch.
Cap 4"x2"
No 8 Gals'd iron wire
Galvanized iron netting No 20 gauge 1 inch
8"x1" board nailed on top of netting
No 8 Gals'd iron wire
Elevation of Fence, Height 3'3"
Alternative Type of Fence
Reference.
1. Door 6'.0"x3'.6" cut in halves. (horizontal)
2 Draming and shearing shed with two 5ft gates in centre to open when required for shearing or other purposes; size 12 x 10 ft inside
3. Gates.
4. Drafting gates 3ft wide
5 and 6. Doors 3ft high made to slide up
7. Tank stand.
8. Bath.
9. Yards.
10. Settling well for drainage
11 Manhole for emptying dip, concrete wall round top and covered with trap door.
12 Drafted sheep yards
13 Sheep race 16" wide
14. Crush pen
15 Holding Yard.
16 Crush pen
17. Window 2'.0"x18" to open
17'.0"
27'.0"
23'.0"
11'.0"
6'.0"
Entrance to Draining Shed.
Concrete wall raised at entrance to shed for the purpose of guiding sheep into shed
11'.0"
Bath.
Level of concrete wall 3" above ground level to avoid entrance of surface water.
5'.0"
3'.3"
Outlet into tail end of Walk-out
Inlet from Draining Shed.
18"
Settling Well for Drainage from Draining Shed. (18"x18")

SMALL SHEEP DRAFTING, DIPPING, AND SHEARING PLANT.

# ENSILAGE FROM GOAT'S-RUE.*

W. DIBBLE, Fields Inspector.

In the past season a stack of goat's-rue ensilage was made on Mr. A. Buchanan's estate, near Ashhurst (Manawatu). The material was stacked between the 6th and 13th January, 1916, and by the 1st August it was being fed to dairy stock. It is brown in colour, and the aroma is all that can be desired. The temperature in the making ranged from 130° to 140° F. The size of the stack when made was 20 ft. by 20 ft. by 10 ft., but when the weight was applied the material settled down considerably. Owing to the succulent nature of goat's-rue I would recommend that grass be mixed with it to withstand the pressure.

At the time of a visit made by the writer to Mr. Buchanan's place a dray loaded with goat's-rue ensilage was being served out to the dairy herd, and the cows ate it quite greedily. The stock had been grazing on good pasture, and had also been fed on the ensilage for some considerable time with apparently no ill effects.

It is not recommended to grow goat's-rue except for special purposes, such as sowing the seed and letting the growth accumulate to make humus on poor soil, and then leaving it to gather nitrogen for a few years. But where goat's-rue is growing wild and has to be cut, in order to compensate the farmer for his outlay in cutting it may be gathered and mixed with a crop of grass and clover that is being made into ensilage at that particular time. If growing in sufficient quantity, however, it can be made into ensilage by itself, as was done in the instance under notice. Care must be taken to cut the goat's-rue when in its early stages —about 2 ft. 6 in. in height—and the stuff cut must be practically free from dead stalks of the preceding year's growth.

It is worth noting that on a property adjoining Mr. Buchanan's estate, divided from it only by a post-and-wire fence, there is no goat's-rue, although at the time of writing the goat's-rue is about 2 ft. in height in close proximity to the wire fence on the one side. It appears that the plant is killed or kept down by heavily stocking with sheep during the early spring months. The illustration shows part of the boundary-line between the two properties.

*A description and general account of goat's-rue (*Galega officinalis*) was given in the *Journal* for February, 1916, page 125.

FEEDING OUT THE GOAT'S-RUE ENSILAGE.

GOAT'S-RUE ON BOUNDARY-LINE. CLEAR PADDOCK ACROSS FENCE GRAZED WITH SHEEP.

The goat's-rue in its winter state, showing quantity of dead growth.

# LUCERNE NOTES.

A LUCERNE plot coming to its second spring, provided the plants are abundant, should never be given up as a failure until the land has been well cultivated and a check given to the growth of weeds. The lucerne may be injured if it is handled too roughly, but it will be found a hard plant to kill by surface cultivation.

Before sowing lucerne it is essential that the seed-bed be in good tilth, and also firm. The seed must not be buried at all deeply. Inoculated soil should not be exposed to a hot sun, and preferably should be distributed on a cloudy day, and immediately lightly disked or well harrowed in. Land intended for lucerne should invariably be rolled with a Cambridge roller before broadcasting or drilling the seed. Those anxious to sow this season on land already limed and prepared, but where difficulty from weeds is anticipated, might with advantage drill in 28 in. drills and intercultivate. This would probably result in the establishment of a crop, and would most likely accomplish the inoculation of the soil, while the interspaces would be cleaned from weeds. If these interspaces were drilled into 7 in. drills or broadcasted about January or very early in the autumn directly after the crop had been cut, a full stand might probably be obtained before the advent of winter. It may be taken as a general principle that although in districts such as parts of Hawke's Bay, &c., early sowing may be necessary on account of the likelihood of a dry spring, still usually it is a faulty practice to sow before the soil has become thoroughly warm and a rapid growth can be counted upon. Weeds grow in cold weather, but newly sown lucerne does not. When the young plants are up they should be carefully watched, and as soon as ever they are rooted sufficiently to stand a fair pull a light harrow should be passed over the land to cripple, if not to kill, the surface weeds. By so doing much afterwork may be saved.

The clipping of young lucerne when about 9 in. high is not always advisable. Personally, provided the land is clean and the lucerne-plants are healthy and making vigorous growth, I would not cut it until the small white spurs at the crown of the plants are formed. These are the provision for the next growth, and they are usually present when about 10 per cent. of the plants are in flower. If, however, the land is weedy and a hard crust has been formed on the surface of the soil, and the plants are weak and sickly, clipping not too low, followed by a light harrowing, may be beneficial.—*G. de S. Baylis, Fields Supervisor.*

# WORK FOR THE COMING MONTH.

## THE ORCHARD.

J. A. CAMPBELL, Assistant Director, Horticulture Division.

### THE FRUIT INDUSTRY AND THE NEW SEASON.

It goes without saying that every orchardist is desirous of having a successful season. What constitutes a successful season can only be judged by the returns received at the end of the year for fruit sold. The quantity of fruit available for sale must necessarily play a large part in this, but heavy crops are not necessarily a true indication, as quantity is not the only thing to be considered. In a ready market with little competition quantity may play the leading part and work out satisfactorily, but under reverse circumstances the question of quality has to be considered. In fact, under anything like keen competition, such as exists in the fruit-markets of New Zealand at the present time, the quality of the article must be given preference over quantity.

This position in regard to the fruit-markets is likely to become more pronounced as time goes on and the yield of the many acres of young orchard finds its way on to the markets increasingly year by year, which will no doubt perforce result in the abandonment of the practice, only too common among commercial orchardists, of encouraging or allowing a fruit-tree to bear as heavily as possible, regardless of the size and general appearance of the fruit. Not only must this practice cease, but all other haphazard methods must also go. Successful orcharding means careful and scientific management throughout the year, with high-quality fruit and as much of it as possible to sell at the proper season, but no rubbish. The fruit business is moving along rapidly. The pinch of overproduction is not yet felt, and it is to be hoped it never will be felt to a greater extent than is sufficient to raise the general standard of the fruit marketed, and to wholly eliminate the rubbish and much of the inferior fruit too commonly met with on the New Zealand markets.

A general movement is on foot throughout the leading fruit-growing districts of New Zealand. New fruitgrowers' companies are being formed, and cool stores and central packing-sheds are being erected for the purpose of handling the fruit crop. Others will no

doubt come into existence, with the result that such companies, together with those already in operation, will in the near future control the bulk of the packing of apples and other fruits. The policy of such companies will be to standardize grades and to make a feature of the quality of their pack. This will mean that prices will be fixed for the various grades, and the grower will receive payment according to the manner in which his fruit grades out, thus rightly placing a premium on quality. This should also result in considerable improvement not only in the quality of the fruit placed on the market, but also in the reliability of the pack, as growers not associated with such companies must be detrimentally affected if they fail to adopt similar standards.

Growers in those districts where fruit-packing companies are operating should particularly note the practice that is sure to apply in the purchase of fruit, and act with the idea that a crop—if necessary a limited crop—that grades out well will be the most profitable. To bring this about there are many factors that must be considered. We have now arrived at the opening of the new season, and it will be therefore advisable to touch upon the principal requirements with a view to putting into practice those that are applicable from now onward.

## FACTORS IN FRUITGROWING.

The requirements of an orchard for the production of fruit of high quality and appearance include the following: Shelter; regulation of moisture by means of cultivation and drainage; an adequate supply of phosphoric acid, potash, and nitrogen; careful attention to pruning and training the tree; thinning; and the control of diseases without damage to the fruit or foliage.

*Shelter.*—An orchard requires to be adequately sheltered to protect the trees against damage from wind, and also to guard against windfalls and branch-blemished fruit. The last-mentioned factor often becomes serious in connection with the lateral system of pruning apples and pears—*i.e.*, the retention of weak and moderately weak laterals. This system works very satisfactorily in bringing a tree into bearing, but the percentage of branch-marked fruit is invariably high, owing to the position and flexibility of the wood when the tree is exposed to the wind.

Although the practice of retaining laterals in the first place is right, in most instances the retention of such laterals is unduly prolonged, and unnecessary risk of this form of blemish is thereby run. For this reason and for general utility purposes the laterals,

after bearing and producing fruit-spurs, should be shortened in as soon as possible until the fruit is borne close to the main limb.

*Moisture.*—The regulation of moisture requires a proper and efficient drainage-system to carry away excessive moisture at any season, but the regulation of moisture during the summer mainly consists of proper cultivation. The orchard soil is thoroughly ploughed and worked down in the spring—exactly when depends on the nature of the soil and climatic conditions, but it is inadvisable to delay this work until the hot weather sets in. Under such conditions the deep working necessary leads to a considerable loss of moisture, which, if not replaced by rain, means that the summer has to be faced with a soil more or less depleted of moisture, which is a risk that should be avoided. Subsequent work consists of frequently disturbing the surface soil with the cultivator, the resulting layer of loosened soil acting as a mulch, thereby retarding evaporation.

*Fertilizers.*—Phosphoric acid and potash play a very important part in the texture and colour of the fruit and also on the wood of the tree. More or less of both are found in practically all soils, but where either or both are deficient in an orchard soil they are usually supplied by means of fertilizers, and are best applied in late winter or early spring. Phosphoric acid may be given in the form of superphosphate, bonedust, or basic slag. Bonedust is slower acting but more lasting than superphosphate. Constant and heavy application of the latter is credited with making the soil more or less acid, therefore lime should be freely used to correct this action. Lime is otherwise beneficial to most soils, and is best applied in the autumn, following with the other fertilizers later. Basic slag is preferable to superphosphate for heavy damp soils—in fact. the super should not be used in such circumstances. Sulphate of potash, muriate of potash, and kainit are commonly used to supply potash, the former being by far the most popular, although difficult to obtain at the present time. Stable manure is recognized as the best all-round manure obtainable, but for general orcharding purposes it is regarded as practically out of the question, owing to the difficulty of obtaining supplies. Nitrogen is mainly necessary when extra growth is required, and is usually supplied to the soil in the form of sulphate of ammonia or nitrate of soda, or by means of cover-crops composed of leguminous plants. The ploughing-in of such crops also supplies humus to the soil, which is in most cases necessary where commercial fertilizers are being used.

*Pruning and Training.*—Pruning and shaping the tree has a great effect on the colour and maturity of the fruit it bears, particularly with the apple. The tree should be trained with an open centre, with the main limbs and branches well spaced. Overcrowding of growth should be avoided and the maximum provision made for air and sunlight; at the same time sufficient foliage should be provided for along the main limbs to protect the bark against the danger of sun-scald. Laterals should be treated as previously mentioned.

*Thinning.*—This is a very important matter in the production of fruit of high quality and appearance, and receives far less attention than it deserves, particularly in respect to the apple. Peach-thinning is appreciated and regularly practised by many peach-growers, but even in respect to this fruit much more work in that direction could be done with advantage. With the average apple-tree in full bearing thinning becomes a necessity for the benefit of the tree and its crop. When this is properly carried out inferior fruit is reduced to a minimum, while the main crop is more even in size and superior in every way, and often little reduced in weight.

*Spraying.*—Spraying and the diseases that necessitate the work contribute largely to the percentage of blemished fruit in the average fruit crop. Black-spot and spray-scorching are the principal causes. The disease itself, if not thoroughly checked, renders the fruit quite useless from the point of view of appearance, while the scorching resulting from injudicious spraying for its control has almost an equally bad effect. Scorching can take place at any time during the growth of the fruit, but the greatest danger is when the fruit is young and the skin tender. The effect on the foliage is the opposite. Foliage will invariably stand a stronger spray when young than it will later, therefore the best time to use a comparatively strong spray, culculated to give the best results, is when the foliage is first appearing, or when the cluster of buds burst and show colour or the most advanced blossom-buds burst into bloom. Bordeaux mixture is the most reliable fungicide in use, but it is mainly accountable for the russeting of fruit when applied during the summer. It can, however, be used with safety at the stage above mentioned; so also can the lime-sulphur solution. For later sprayings lime-sulphur is preferable, as it is less likely to damage the fruit, but as it is not as reliable a fungicide as Bordeaux mixture the latter should be resorted to if the season is such that outbreaks of spot occur.

### MILDEW.

This is a disease that should be considered more seriously than it apparently is by the average orchardist. The disease affects the young growths, consequently reaching the health and growth of the tree. The work necessary for controlling mildew at the present stage consists of cutting away all affected parts that were overlooked in the winter pruning, and spraying the tree with some form of sulphur. Sulphur in a finely divided form is recognized as being the most effective on the mould forms of fungus diseases. There are several preparations on the market, and no doubt the whole of them are good; they include lime-sulphur, atomic sulphur, soluble sulphur, &c. Lime-sulphur is the most popular, as it has been longer in use and is therefore better understood. Spraying should be done as soon as the foliage appears, and should be repeated at intervals throughout the season.

### CODLIN-MOTH.

Calyx-spraying for codlin-moth in order to be thoroughly effective should be done twice, the first time as soon as two-thirds of the blossoms have fallen, and again when the remainder have fallen. The object of this spraying is to thoroughly fill the calyx-cup with a poisonous mixture, so that when the calyx closes a quantity is retained and held in the form of a trap for grubs subsequently endeavouring to enter the fruit at this point. To avoid the risk of scorching owing to the tender nature of the skin of the fruit at this stage it is better to reduce by one-third the strength of spray ordinarily used for the control of moth. Use plenty of the mixture when spraying, in order to do the work thoroughly. Apply at a high pressure. Use an angle nozzle, and spray downward mainly, as a large number of the fruits at this stage are in a vertical position, calyx uppermost.

### STRENGTH OF SPRAYS TO BE USED.

*Black-spot.* — To be applied as the buds show colour. Pears: Bordeaux mixture 6-4-50 or lime-sulphur 1–15. Apples: Bordeaux mixture 4-5-50 or lime-sulphur 1–30.

*Black-spot and Codlin-moth.*—Calyx-spraying. Lime-sulphur 1–100 to 1–120, with 2 lb. to 2½ lb. arsenate of lead added.

*Powdery Mildew.* — Lime-sulphur 1–30 as the foliage appears. A weaker application would do as well, but at the strength given this spray also acts as a preventive for black-spot. Later application—lime-sulphur 1–100 to 1–120.

# THE POULTRY-RUN.

F. C. BROWN, Chief Poultry Instructor.

## BROODER PRACTICE.

A PRELIMINARY essential to the successful rearing of artificially hatched chicks, whether it be with a heated or a fireless brooder, is to ensure that the eggs intended for hatching purposes contain strong germs, the basis of which is allowing in the breeding-pens only birds that possess a strong constitution. Not only must the breeding-stock be constitutionally strong, but they must be maintained in a perfectly healthy state during the whole time they are producing eggs for reproductive purposes. Where eggs are being laid with pale sickly-coloured yolks it may be taken for granted that the food supplied is not what it should be, and that trouble will be met in both the hatching and brooding stages. Eggs containing the deep-coloured yolk are the most desirable for hatching purposes, and neither the deep-coloured yolk nor a good healthy germ can be secured from a bird which is poorly fed. Generally speaking, the greater the range given to the breeding-stock the stronger will be the chicks produced.

When a strong, healthy hatch of chicks is secured and they are placed in the brooder, the first thing to attend to is the heat. Care must be taken to see that a uniform degree is maintained, especially during the first fortnight. Undoubtedly variation of temperature is the chief cause of mortality. In this respect the mother hen gives a striking lesson. Independent of the weather conditions prevailing, the bodily heat she imparts to her chicks is never too great nor too little. The brooder, if not properly constructed or managed, may easily bring about either extreme. To be successful in artificial chicken-rearing the attendant must largely take the place of the natural mother. He must keep a close watch on the chickens and endeavour to anticipate their requirements, not waiting to adopt preventive measures until some trouble has so badly affected the little ones that they are not worth rearing. Prevention at all times is the only safe course to take. It is always a waste of time to doctor weaklings. They frequently not only acquire the habit of huddling, but also teach the stronger birds to do so, and cause much mortality.

In nature it is only the fittest which survive to maturity, and consequently only the strongest birds are permitted to perpetuate the species. An important feature in favour of the

fireless brooder described elsewhere in this issue, as compared with the heated brooder, is that any weak chickens placed in the former usually succumb during the first few days. Another recommendation for the rearing of chickens in this particular cool brooder is the absence of bowel trouble. It is only on very rare occasions that any sign of bowel complaints have been observed during the several years the brooder has been in use at the Department's Milton Poultry-station. The fact that bowel trouble, arising from chill, is so common with chicks in process of rearing in heated brooders undoubtedly indicates that extreme temperatures are the chief cause—mostly through failure to provide a means for the chicks to get away from the heat when it is excessive.

Of course there are other ways in which chickens become chilled. Giving them too much freedom at the start (whereby they lose their bearings), reducing the artificial heat too suddenly, or providing insufficient ventilation in the brooder-box are frequent causes. Do not take the whole of the heat off the brooder during the day. Most brooder troubles can be overcome by studying nature. The hen gives the chicks a regular warm-up even on the hottest days, and at the same time allows them to breathe the fresh air, but always keeps them under control. More depends on regular temperature, ventilation, and cleanness than on any particular method of feeding.

Good feeding, of course, is essential, and only sound grains should be used. The best food ration ever planned, however, will not have the desired result if the management is wrong in other respects. Do not give chickens any gristed grain which has not been sufficiently broken, as they are apt to pick up the large pieces, which are too large to leave the crop, with the result that the chick dies of starvation. When chicken-food contains particles which are too large it should be sifted to suit their age.

It is always advisable to open up any chicken that dies, in order to discover, if possible, the cause of death. Chickens frequently die through eating the joints of the grain-stalk in the chaff, long pieces of fibrous material, and the pickings from sacks, curtains, &c., which form a ball in the gizzard, with fatal results. Any injurious materials should be kept out of reach of artificially hatched chicks, which have no mother to guide them as to what they should eat. Do not on any account overcrowd, or the mortality will be great. It is more profitable to rear a few chicks properly than many indifferently.

It is useless trying to rear the incubator chick if the quarters are not kept in a thoroughly sanitary state. Before a new hatch of chicks is placed in a brooder it should be well cleaned and disinfected. The trouble of chicks picking each other is mostly caused for the want of something better to do. Give them pieces of tough meat to keep them running, also ample room to exercise, and they will soon forget the habit. Healthy brooder chicks should be constantly on the move, running out to feed, and occasionally back again under the hover. Green food is essential for chicks of all ages, and provision should be made that a constant supply of succulent material is always available. When grass is being fed it should be finely cut, otherwise injurious effects are bound to follow.

The common trouble of chickens going weak in the legs is mostly due to huddling and the need for greater warmth. The trouble is often intensified by insufficient bedding on the floor. Especially does this apply when the floor is very smooth—the constant slipping on the smooth surface during the huddling effort having the effect of spreading and weakening the delicate legs. A piece of sacking spread over the floor, on which the bedding is placed, will greatly assist in preventing the chicks from slipping and its consequent effect on their legs.

It is always a mistake to allow chicks of different ages to run together. Keep them apart from the adult stock, as there are few old birds that are quite free from vermin. The incubator-hatched chicken, given careful management, should go right on to maturity without having to fight parasitic life.

### THINGS TO REMEMBER.

Overcrowding is bad enough in any branch of the plant, but it is especially disastrous with the young tender stock.

Keep the chickens on the hungry side for the first few days, only allowing them what they will pick up in a few minutes.

Chicks drink frequently, and an irregular supply is sure to have a bad effect on them.

The chick that receives a serious set-back seldom or never proves a profitable bird to rear.

A chicken is hatched with a good supply of natural food. Therefore sleep and a comfortable degree of heat is all it wants for the first day after it is hatched.

The spreading of the chicks in the brooder should at all times be studied as well as the thermometer. When they are well spread out it indicates that they are comfortable and that the degree of heat is correct.

# THE APIARY.

E. A. EARP, Apiary Instructor.

## FEEDING.

As advised previously, keep a strict watch on the food-supply. As the spring advances this matter becomes of paramount importance. On no account allow the stores to dwindle. The queen's laying-powers are to a large extent automatic: as she is fed so will she lay, and when food is abundant brood-rearing will be in proportion. Do not forget that artificial feeding is invariably stimulating, and once undertaken must be carried out regularly and systematically. It is poor policy to fill a hive with brood and then leave it to starve. Spring losses are usually due to lack of stores, and are therefore preventable on the part of the beekeeper. Feed sugar syrup only in the proportion of 2 parts of water to 1 of sugar, and place in the feeder while slightly warm.

## WATER.

In the absence of a natural supply, water should be provided. Bees require a good deal of water for brood-rearing throughout the whole season, and it often happens that numbers of bees are lost if water is not close at hand. Moreover, bees often become a nuisance at cattle-troughs and by congregating round domestic supplies. Where a large number of colonies are kept it is imperative that the beekeeper should see that the bees are well supplied. Many contrivances are used for the purpose of supplying water. "Simplicity" feeders make excellent vessels for containing water, but they require to be filled frequently and occasionally cleansed. A good contrivance is to use a kerosene-tin as follows: Having thoroughly cleansed the tin, punch in the bottom a hole about the size of a sixpence; through this hole pass a piece of clean rag so that the water will fall a drop at a time. Under the tin a container may be placed to catch the water, and this, if filled with sand, will afford an excellent watering-place for the bees. The supply can be regulated according to the requirements of the apiary. Bees prefer to take water from damp situations, and they may often be noticed in numbers sucking water from the ground where there has been any overflow. Feeders should be placed in a sheltered spot in the apiary.

## FOUL-BROOD.

At all times when examining the combs keep a strict watch for symptoms of disease. Beekeepers should never lose an opportunity of acquainting themselves with foul-brood in all its stages. This season if isolated capped cells are discovered in frames which contain

no other brood, these should be treated as suspicious and subjected to the test for foul-brood. If on opening the cell, when a sharp pointed piece of stick is inserted, the dead imago can be lifted out complete in form, the beekeeper may conclude that if dry it is a case of starvation and if moist of chilled brood. If, however, the contents of the cell adhere to the point of the stick in a ropy ill-smelling mass, it may be concluded that the hive is diseased. There is perhaps no surer indication of the presence of foul-brood in the hive than the objectionable smell of the decayed larvæ. Beekeepers who once recognize this odour will have no difficulty in detecting the disease in that stage. The last and most difficult form of foul-brood is the dry stage, and in this form it has baffled beekeepers of long standing. Only a careful examination can reveal its presence. The diseased larva, having dried to a scale, adheres to the lower side of the cell, and can be removed by scraping with a sharp-pointed instrument. If the aforesaid isolated capped cells on being opened appear at the first glance to be empty, they will almost invariably yield a scale if examined, and the hive should be marked for treatment. There is a deeply rooted superstition among beekeepers that foul-brood can be detected outside by the odour, and inexperienced beekeepers are often misled by this statement, affirming that as no smell comes from their hives they are clean. When the odour of foul-brood can be detected from the outside at the distance of a few feet the hive is diseased beyond redemption. Fortunately such cases are rare.

### TRANSFERRING BOX HIVES.

It is against the law to keep bees except in properly constructed frame hives, and persons breaking the law are liable to be prosecuted. Bees kept in box hives are of little value as honey-producers, and in addition the combs cannot be examined for disease. The work of transferring can be carried out in the spring or any time during the season when brood is being raised. To lessen the work choose a time when the bees are busiest in the fields. Prepare a new frame hive having ten wired frames fitted with foundation. Before commencing the operation put on a bee-veil, and then blow a few puffs of smoke in at the entrance of the box hive to be transferred. Then lift it to one side and place the frame hive on the old stand with entrance facing the direction which the box hive had faced. The latter is now turned upside down and a box, preferably of the same size, is placed on top, mouth to mouth, and then by drumming continuously for ten or fifteen minutes on the sides of the lower box with stout sticks the bees are made to desert the combs and take refuge in the empty box. When most of the bees have gone up into it the box may be removed and the bees dumped on a bag

in front of the new hive. Repeat the operation until all the bees are transferred. The box hive should be immediately removed to a place of safety and the combs cut out, each one being carefully examined in case the queen has not left the old hive. Occasionally she is the first to leave, but more frequently she is among the very last.

This method may be used where the beekeeper is absolutely certain that his hives are free from disease, but as a large percentage of box hives are more or less affected with foul-brood it is wisest to vary the method thus: In place of the full sheets of foundation substitute 1 in. strips or "starters" of foundation and leave the bees on these for four days. After this period the strips must be replaced by new frames containing full sheets of foundation. This latter operation will eliminate the disease. If the colony is free from disease, in order to save the healthy brood the latter may be fitted into empty frames and held in place with stout string or tape tied from the top to the bottom bar, and then placed in the new hive. In the course of a few days the string or tape can be removed, as the combs will be securely waxed by the bees. However, these combs could not be used as extracting-combs with any satisfaction, as absence of wire would render them liable to break in the extractor.

It is not advisable for the tyro in beekeeping to attempt to save any brood from a box hive, as foul-brood in some stages cannot be detected except by an experienced apiarist, and by far the safest plan is to destroy all the combs from the transferred hive, thus ensuring that the frame hive begins its career free from disease. Care should be taken to destroy the starters on which the bees have been working during the first four days in the new hive.

## LOCATING AN APIARY.

Perhaps there is no more important question to the beekeeper than location. Upon his ability to select a suitable district in which to start beekeeping will depend his future success. There are few districts in the Dominion where bees cannot be kept in small numbers, but successful establishment of a commercial apiary will largely depend upon the beekeeper's knowledge of the nectar-secreting plants. It is generally recognized that the main nectar-flow in New Zealand is produced from white clover and catsear, but it will be found to be a distinct advantage if the apiary is established in a district near patches of native bush or where the golden willow is abundant. Most of the indigenous trees and willows flower early, and the nectar from these sources is very valuable to the beekeeper, as it provides ample stores in the spring.

In districts where the beekeeper has to depend entirely upon white clover a careful watch must be kept on the stores, and

very often artificial feeding has to be resorted to in the spring and carried on until the appearance of the clover-bloom. This is often expensive, and can be usually avoided by selecting a site where at least a moderate spring flow may be anticipated. The rich dairy pastures of both the North and South Island, and localities where cattle-raising is carried on extensively, provide suitable sites for commercial apiaries, while country which is used for sheep-grazing is not profitable, as the clover pasture is usually eaten bare. Instances have come under my notice where abnormal crops have been secured in purely sheep-country, but they are too infrequent to be taken into consideration, and consequently this class of country should be avoided. Essentially the main requirements are feed and shelter, and if the apiarist is fortunate enough to locate his bees in a position where there is an abundant supply of nectar-secreting plants, good shelter can be easily provided.

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## THE FARM GARDEN.

W. H. TAYLOR, Manager, Arataki Horticultural Station.

### VEGETABLE-CULTURE.

In the usual course of routine management peas are sown at intervals of two weeks all through the summer months. Turnips should be sown every seventh or eighth week. Turnips do not remain tender long in hot weather after they are fully developed. They should, indeed, never be left till they reach that stage; it is best to sow small areas, and use the bulbs as they become large enough, but never at full size. French beans and runner beans may be sown in most places. The first day of October is the accepted time for the southern half of the North Island. I have never seen good results follow any attempt to get ahead of that time. It is not merely a question of dodging frost, but a matter of soil-temperature; until the soil is warm the plants will not thrive.

Leeks should be sown at once. When well grown they are one of the most valuable winter and early spring vegetables, and there is no vegetable plant more sure to give good returns. Leeks will grow in any class of soil, and are not subject to any blight, nor are they specially attacked by insect pests. They are essentially a vegetable for the small garden and for the busy man. Not only are the results sure, but the plants make a crop of long endurance. Sown now, the first should be ready for use in May. As time goes on they increase in size until

they go to seed in October. They are thus in use from the same planting over a period of from five to six months. Many are deterred from growing leeks to any extent because of the labour of digging trenches, which also take up a lot of room. Not only are trenches not necessary, but this is not even the best way to grow leeks. That part of the cultivation, however, can be left to a future date. At present all that is necessary is to sow the seed in a line for transplanting later on. Any of the kinds on the market are good enough; there appears to be but little difference between them.

Red beet should also be sown at once. The long kinds are best for winter use; the turnip-rooted are the most suitable for early use, as they come quicker, and are of very tender quality during the summer months. Red cabbage for pickling requires to be planted early—the seed should have been put in before now. Plant out as soon as large enough; if they are treated to midsummer planting they will, to a large extent at least, fail.

The best time to sow for the main crop of parsnips depends to a large extent on the purpose they are expected to serve. For my own part, I regard them as a winter crop, and in a private garden they should not be wanted till that season. Sow early in November and they will be early enough and come in when other vegetables are getting past. The roots are the more tender for not being too old, and that alone is sufficient reason for not sowing too early; there is also the question of space which can be otherwise employed. Those, however, who are growing for market must sow parsnips now, though they may sow again later; but one crop should be sufficient for a private garden. The same remarks apply to carrots—that is, for practical purposes.

Broccoli and Brussels sprouts should be sown. With the latter it is important to sow at once; Brussels sprouts put out late never do well. Broccoli may be left till a month later, but it is best to sow at least the early varieties at once. Savoys should not be sown for several weeks—say, towards the end of October. Local conditions, however, have a considerable influence, and the aim should be to delay the sowings so that they do not come into use till the weather is cold. From now on lettuce-seed should be sown in lines; sow thinly, and thin the plants instead of transplanting. Sow radishes every four or five weeks. I prefer, as a rule, not to specify varieties, but must recommend the long white Icicle, which I have found to stand hot weather remarkably well.

Tomato-plants should be in an advanced state in the boxes in which they were pricked out. There should be no hurrying to get them out of the glass structure; let them make good

growth first, and then give them plenty of time to harden. Never put them out in the ground till warm soil is assured.

Potatoes: For the early crops at least well-sprouted sets should be put out. Every set should be examined, and only those with sturdy shoots should be planted. If the sprout comes off with a slight touch the set is not fit for planting.

## SMALL FRUITS.

There are many inquiries about Cape gooseberries. The chief trouble appears to be unsatisfactory results the first year. My own experience has been that there is never any reason for dissatisfaction when the seed was sown in autumn. By sowing in autumn the plants put out in spring are well hardened and woody, go away at once, and do well. If, however, the plants are raised in spring they are soft when put out, are checked by a spell of rough weather, and seldom do well.

Strawberries: The soil should be kept open by cultivation, and weeds cleared off preparatory to mulching to keep the fruit clean. Spent hops from a brewery are excellent for mulching; they conserve moisture to a greater extent than anything else I know of. The hops should be stacked for a short time before putting them on the bed, so as to drain off and sweeten. Coarsely cut straw chaff makes a good mulch. The worst possible material is green grass, particularly that cut on lawns by a machine; it taints the fruit.

Raspberries: Keep the hoe or cultivator going among the bushes; keep weeds down and the soil open. Cut out all waste suckers on raspberry-beds; they rob the fruiting-canes.

Look out for gross shoots on gooseberry-bushes; they are prone to start where branches were cut out. At this time the shoots indicated are very soft and can be pushed off; if allowed to develop they become troublesome and lead to some amount of labour.

## THE FLOWER-GARDEN.

One is asked many questions as to why plants fail to grow. Frequently it is quite impossible to answer the questions with any degree of certainty, as one cannot guess at what has been done. One common cause is undoubtedly the improper use of manure. Manure is not a panacea for all evils indeed, it is more frequently the cause of death to plants. Some plants are so hardy in nature that they take a lot of killing; others, again, are more susceptible to injury. Hard-wood plants, like camellias, rhododendrons, kalmias,

heaths, to a less degree azaleas and andromedas—in fact, all plants that are of what one may term a choice nature and hard-wooded—simply will not root into strong manure. When a plant has become established it may be given manure with advantage; a like treatment might kill it at an earlier stage. Briefly put, manure is a stimulant only to be given to a healthy, well-rooted plant. For the intelligent use of manure a person must be able to tell when a plant is in want of fertilizers, and when it is roots that are required. It may be taken as an axiom that plants of the class mentioned never require manure until they have become firmly established. Such subjects should be planted in clean soil; no manure, natural or artificial, should come in contact with the roots.

Plants growing in pots are usually potbound, and before they are planted in the open ground the ball of earth and roots should be broken. The roots must be disentangled at least to some extent, so that the soil may key into the ball and among the roots; the soil should be pressed very firmly about the roots, and it should be clean soil. Watering is rarely advisable when putting out a plant; there are exceptions, but the rule is as stated. Watering is likely in the majority of cases to rot the roots.

Current work will include planting out box stuff of various kinds, leaving the more tender subjects till danger from frost is past. Hardy annuals of all kinds may be sown. Violets may be planted as soon as flowering is over. It is advisable not to delay the operation, for they grow away at a great rate when they cease flowering, and the young runners should be in their new quarters as soon as possible. Choose young runners from the outside in preference to the older parts; although the latter are the strongest the young ones are the best. The old ones, however, may do very well indeed, and it would be better to replant them than young runners if the latter are very weak. As to the reason for transplanting, the plants becoming crowded exhaust each other, and separation is on that account necessary about every third year. If time cannot be found to transplant, it will do good to thin out the crowded plants. This should be followed by some manurial application, a sprinkle of bonemeal first, and a good mulch of half-decayed stable manure over it. In places where the soil is very dry and dries out very much in summer this treatment is better in results than transplanting.

Gladioli should be planted—the large-flowered kinds. They require well-trenched ground and planting at least 6 in. deep. Dahlias are mostly ready for planting. It is a good plan to dig a hole deep enough to hold a good forkful of manure and plant above it, thus encouraging the roots to go down out of the dry surface soil.

# ANSWERS TO CORRESPONDENTS.

**IN every instance a question to which an answer is desired in these columns must be accompanied by the full name and the postal address of the inquirer, not necessarily for publication, but as a guarantee of good faith. The question should be written on one side of the paper only.**

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### PROPAGATING ELEAGNUS JAPONICA AND TECOMA CAPENSIS.

CHARLES G. MURRAY, Waiuku :—

I would be much obliged if you could give me any information with regard to putting in cuttings of *Eleagnus japonica* and *Tecoma capensis*. Is it too late to put them in this year? If not, what sort of ground, &c., would you advise me to put them in?

The Horticulture Division :—

It is decidedly late for putting in cuttings of *Eleagnus japonica*. Local conditions may, however, make it quite safe to do so. Certainly we have put them in later than now—in fact, up to the end of September. The summer condition of the soil is the ruling factor: if it keeps fairly moist, the cuttings will do. Cuttings put out late should be not less than 12 in. long. The cuttings should be put in deep: bury fully two-thirds of their length. Tread them in tightly. Keep the soil on the surface always loose.

*Tecoma capensis* may be increased by layers put down in autumn. It is not necessary to tongue the branches layered. Peg them firmly and cover with soil. Suckers with roots can often be secured. These will grow if separated in autumn or in the spring. Cuttings of current-season wood taken about midsummer, just as the growth is beginning to harden, placed around the edge of a pot in loamy soil surfaced with sand, and placed in a cold frame, will root fairly well. The cuttings should be 3 in. or 4 in. long.

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### THRUSH IN HORSE'S FOOT.

"DAIRYMAN," South Oamaru :—

Would you kindly advise me the cause of thrush in a horse's foot, and the cure for same?

The Live-stock Division :—

The cause of thrush is often due to a horse standing in dirty wet places, or doing hard work in rough stony country. To treat a case, pare the frog of all diseased and ragged horn; poultice for twenty-four hours, and afterwards dress the frog with a solution of copper sulphate (1 oz. in half a pint of water). Dress daily and protect the foot with a bandage or boot.

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### HORSES STAMPING.

JAMES. R. WILKINSON, Loburn :—

Would you kindly refer again to the subject of "stamping" in horses. I note a reference to it in the May *Journal* (page 411), where the cause is deemed to be greasy heel. Is the greasy characteristic noticeable always when present? I hear my gig-horse stamping a good deal in the loose-box at night, but I cannot detect anything wrong about the foot or fetlock. Many farmers and contractors tell me their horses stamp through some sort of itch that is not noticeable. I noticed the habit in two gig-horses last winter when I had some pea-straw as litter.

This year I have Solid Tuscan straw, and I have thought it possible some such kind of litter may break easily into irritating spicules. My horses are on a very fair field of grass all day, and I have not this winter added oats to the oat-sheaf chaff. I do not like to hear the stamping, and would be glad of some advice.

The Live-stock Division :—

It is very seldom that a gig-horse suffers from "grease." This complaint generally affects cart-horses, and is usually constitutional. Greasy heel (a different complaint from "grease") does affect light horses, and can be treated by application of zinc ointment. If there are no signs of the hair coming off, heat, or swellings, it may be concluded that the horses are not suffering from any malady to cause the stamping, and that the trouble is due to the coarse bedding irritating the legs. This can easily be remedied.

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## SMOTHER-CROP FOR CALIFORNIAN THISTLE.

"COCKATOO," Taihape :—

Please inform me what you know to be the best crop to grow on Californian-thistle-infested land. The soil is free, deep chocolate loam on open subsoil. We find that the more cultivation of root crop in drill the stronger grows the Californian.

The Fields Division :—

According to present indications, lucerne is the best crop to grow on a Californian-thistle area. The lucerne tends to smother out the thistle. In establishing the lucerne, however, you will require to see that you have provided favourable conditions for its ready growth.

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## POULTRY-BREEDING.

"SUBSCRIBER," Masterton :—

Is it advisable to set the eggs of hens in their first year of laying? Does the one-year-old rooster do for breeding purposes? What is the best age for breeding-birds—hens and rooster?

The Live-stock Division (Poultry Branch) :—

It is preferable to breed from hens in their second laying season rather than from pullets. There is no great objection, however, to breeding from pullets provided they are strong, well-developed birds and have laid over thirty eggs each. It is advisable if using pullets in the breeding-pen to mate them with a second-year male bird. Cockerels over nine months old are suitable for mating with mature hens.

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## SWOLLEN JOINTS IN CALF.

G. S. C., Kihikihi :—

I have a calf four or five weeks old born perfectly healthy. About ten days ago it commenced to walk as if it was strained in its back legs: the joints of all its legs swell up, one or two at a time, and go down again. Some days it moves about nearly normal, takes milk regularly twice a day, and seems otherwise to be doing fairly well. Can you from these particulars give me any information as to what the trouble would be, and a cure?

The Live-stock Division :—

This complaint is probably due to a septic contamination of the navel. As soon as possible after birth the navel-string should be painted with a solution of tincture of iodine, and as an extra precaution the cord can be ligatured with thin tape which has previously been steeped in a good disinfectant solution. The calf should now receive a dose of castor-oil and a dessert-spoonful of malt-extract mixed in the feed once a day. The joints, if swollen, can be hand-rubbed once daily. All feeding utensils must be scalded before use, and the building or shed sprayed with a non-poisonous disinfectant, or otherwise remove the calf to a fresh place.

### CONTROL OF POTATO-BLIGHT, ETC.

J. C. HENDE, Hende's Ferry, Westland :—

Kindly advise the best way to prevent potato-blight. I propose planting half an acre. What seed would be best ?

The Fields Division :—

The most satisfactory method of preventing potato-blight is to systematically spray with Bordeaux mixture. This is made by washing through coarse sacking 4 lb. freshly burnt lime into a solution consisting of 4 lb. best bluestone (copper sulphate) and 40 gallons of water. The whole should be mixed well and kept in a wooden barrel, and wooden buckets used in handling it. A knapsack sprayer will be sufficient for your purposes. Spray the potatoes when 4 in. high, and four or five times thereafter throughout the season. Gamekeeper is a good main-crop potato and is somewhat blight-resisting. Maori Chief is the best blight-resister we have.

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### HEDGE FOR PIPECLAY LAND.

"INQUIRER," Mangapai :—

Can you tell me the best hedge to plant round a garden near a house on pipeclay land in an exposed position ?

The Horticulture Division :—

There are several hedge-plants that would suit your purpose, such as the common laurel, broad-leaved privet, Eleagnus, &c. The last-named should do very well.

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### LOPPING TREE-TOPS.

CHARLES E. LEIREN, Raumai :—

The gale a few days ago blew down many trees, as the ground was so wet. Will you please advise me the proper time of the year to lop the tops of the following : Macrocarpa, insignis, blue-gum, and wattle.

The Horticulture Division :—

Trees may be topped at practically any time. Early spring, however, is considered the best time, as they come away again quicker. In the summer many of the evergreen trees are beneficially affected by the removal of foliage, and there is not the danger of bleeding sometimes feared.

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### FEED CROPS FOR SHEEP.

"INQUIRER," Waitahuna :—

Would a mixture of oats, tares, and rape be suitable to grow as feed for sheep to be eaten off and then ploughed under as manure ? Would the rape grow quick enough, or would the oats and tares outgrow it and give it no chance ? How many times could I eat off the growth and still have a final one to plough under ? Are field-peas suitable for feeding off and still have another growth to plough under ? How often could they be fed off ? What is the usual price of field-peas per bushel ?

The Fields Division :—

Oats and tares are better sown apart from rape for sheep-feed, but you could grow the three together, provided you sow about half the usual quantity of oats and tares. This is for the purpose of not crowding the rape too much, and so giving it a chance to come away through the oats and tares. All things considered, it would be more advisable to sow the rape apart from the others. You could feed off the rape twice and have a satisfactory third growth for ploughing under. On strong land you could even feed off three times and still have a fair aftermath for green-manuring purposes. The field-pea being an annual plant, if fed off thoroughly

it is not suitable for further feeding-off. If partially fed off, however, it puts up additional growth and so is suited for further feeding. The current price of field-peas is about 7s. per bushel of 60 lb.

### REARING MOTHERLESS LAMBS.

F. S., Waitoa :—

I would feel much obliged if you would kindly inform me as to the correct method of rearing motherless lambs.

The Live-stock Division :—

One-third water and two-thirds milk should be given to the lambs to start with. Afterwards the percentage of milk could be increased. It is also beneficial to add a little barley-water occasionally. The liquid should be given at about the temperature of the body. The secret in rearing young lambs is to keep them warm and give them small quantities of food at a time (about half a teacupful) and often —every two hours to start with. All utensils, before using, should be thoroughly scalded.

### PHOSPHATES AND LIME FOR HATUMA DISTRICT.

J. WILLIAMS, Sanson :—

Could you inform me which would be the best manures to sow with rape and turnips in the district of Hatuma ? Being a dry district, I understand it requires a quick-acting manure. Do you think that Ephos basic phosphate would be beneficial in that district ? Although it is a limestone district, would lime-dressing be any benefit to the soil ?

The Fields Division :—

The Hatuma district being fairly dry, Ephos phosphate would not become very readily soluble, except on any heavier low-lying, damper areas. Basic super-phosphate, or superphosphate and bonedust, would be much more suitable. Lime should give satisfactory results except on soils which are obviously well supplied with particles of lime. Frequently soils lying over limestone formation require lime, as the tendency of lime is to go down.

## FORTHCOMING AGRICULTURAL SHOWS.

Southland A. and P. Association : At Invercargill, 7th October.
Hawke's Bay A. and P. Society : At Hastings, 18th and 19th October.
Ellesmere A. and P. Association : At Leeston, 19th October.
Poverty Bay A. and P. Association : At Gisborne, 24th and 25th October.
Wairarapa and East Coast A. and P. Assn. : At Carterton, 25th and 26th October.
Timaru A. and P. Association : At Timaru, 25th and 26th October.
Manawatu and West Coast A. and P. Association : At Palmerston North, 2nd and 3rd November.
Canterbury A. and P. Association : At Christchurch, 9th and 10th November.
Marlborough A. and P. Association : At Blenheim, 14th and 15th November.
Whangarei A. and P. Society : At Whangarei, 14th and 15th November.
Clevedon A. and P. Association : At Clevedon, 18th November.
Nelson A. and P. Association : At Richmond, 21st and 22nd November.
Wallace A. and P. Association : At Otautau, 22nd November.
Egmont A. and P. Association : At Hawera, 22nd and 23rd November.
Otago A. and P. Society : At Dunedin, 29th and 30th November.
Stratford A. and P. Association : At Stratford, 29th and 30th November.
Auckland A. and P. Association : At Auckland, 1st and 2nd December.
Southland A. and P. Association : At Invercargill, 12th and 13th December.
Woodville A. and P. Association : At Woodville, 31st January.
Opotiki A. and P. Association : At Opotiki, 8th February.
Northern Suburban A. and P. Assn : At Takapuna, 16th and 17th February.
Northern Wairoa A. and P. Association : At Mititai, 17th February.
Dannevirke A. and P. Association : At Dannevirke, 14th and 15th February.
North Kaipara A. and P. Association : At Paparoa, 7th March.

## LIVE-STOCK IN NEW ZEALAND.

TABLE SHOWING NUMBERS OF HORSES, CATTLE, PIGS, AND GOATS IN NEW ZEALAND AS AT 31ST JANUARY, 1916. (FOR SHEEP SEE OPPOSITE PAGE.)

| Land District. | Horses. | Dairy Cows. | Total Cattle (including figures in previous column). | Pigs. | Goats. | |
|---|---|---|---|---|---|---|
| | | | | | Angora. | Other. |
| Auckland .. .. | 81,155 | 232,518 | 756,240 | 83,147 | 2,262 | 3,177 |
| Hawke's Bay .. .. | 37,517 | 41,740 | 318,558 | 13,902 | 633 | 994 |
| Taranaki .. .. | 25,053 | 151,888 | 328,061 | 56,710 | 694 | 2,759 |
| Wellington .. .. | 46,006 | 120,276 | 447,528 | 48,185 | 1,005 | 711 |
| Total, North Island.. | 189,731 | 546,422 | 1,850,387 | 201,944 | 4,594 | 7,641 |
| Nelson .. .. | 7,198 | 15,954 | 45,338 | 9,149 | 571 | 945 |
| Marlborough.. .. | 7,187 | 10,790 | 29,622 | 8,629 | 988 | 1,628 |
| Westland .. .. | 1,963 | 6,979 | 24,694 | 2,420 | 14 | 128 |
| Canterbury .. .. | 66,643 | 57,170 | 148,228 | 42,012 | 184 | 124 |
| Otago .. .. | 40,311 | 43,270 | 118,653 | 14,319 | 22 | 6 |
| Southland .. .. | 28,286 | 34,911 | 112,370 | 8,356 | 2 | 23 |
| Total, South Island.. | 151,588 | 169,074 | 478,905 | 84,885 | 1,781 | 2,854 |
| Total, Dominion, 1916 | 341,319 | 715,496 | 2,329,292 | 286,829 | 6,375 | 10,495 |
| Total, Dominion, 1911 | 404,284 | 633,733 | 2,020,171 | 348,754 | 6,119 | * |

* Not collected in 1911.

NOTE.—The 1911 figures include boroughs, while those for 1916 do not. The borough returns are now in course of collection. A few country returns are also still to be received, but are not likely to materially affect the totals.

It will be observed that the figures are given by land districts, and not provincial districts as heretofore.

## STOCK SLAUGHTERED.

THE following statistics show the numbers of live-stock slaughtered at the meat-freezing works and municipal abattoirs throughout the Dominion in the years ended 30th June, 1913–16. The increase in the number of cows slaughtered is particularly worthy of notice.

| | 1913. | 1914. | 1915. | 1916. |
|---|---|---|---|---|
| Cows .. .. | 54,172 | 75,071 | 103,590 | 157,138 |
| Bullocks and heifers .. | 115,298 | 132,307 | 164,970 | 181,995 |
| Bulls .. .. | 10,475 | 11,808 | 12,010 | 15,501 |
| Calves .. .. | 16,423 | 24,470 | 29,131 | 31,374 |
| Sheep .. .. | 3,064,559 | 3,269,456 | 3,792,131 | 3,521,264 |
| Lambs .. .. | 3,944,231 | 4,039,189 | 3,959,402 | 3,948,205 |

## CROP STATISTICS.

FIGURES issued by the Government Statistician give particulars of certain crops in the Dominion for the season 1915–16, as follows: Barley (for threshing only), 28,653 acres, yield per acre 28·52 bushels; rye-grass, 42,248 acres, yield per acre 18·44 bushels of 20 lb.; cocksfoot, 13,630 acres, yield per acre 120·36 lb.; potatoes, 28,053 acres, yield per acre 4·56 tons. The figures are subject to slight revision on account of outstanding returns. Details of the wheat and oat crops are published on page 254.

# SHEEP IN NEW ZEALAND.

## SHEEP IN RESPECTIVE SHEEP DISTRICTS AS AT 30TH APRIL, 1916.

| — | Auckland. | Napier-Gisborne. | Wellington-West Coast. | Marlborough-Nelson-Westland. | Canterbury-Kaikoura. | Otago (including Southland). | Total in Dominion. |
|---|---|---|---|---|---|---|---|
| Stud rams .. .. .. | 1,321 | 2,569 | 4,899 | 576 | 3,600 | 2,149 | 15,114 |
| Flock rams .. .. .. | 21,523 | 76,979 | 70,489 | 15,811 | 62,165 | 54,050 | 301,017 |
| Wethers .. .. | 290,883 | 774,516 | 872,319 | 202,270 | 578,328 | 759,947 | 3,478,263 |
| Breeding-ewes .. .. | 956,294 | 3,142,463 | 3,131,693 | 704,837 | 2,625,576 | 2,331,904 | 12,892,767 |
| Dry ewes .. .. .. | 47,843 | 255,898 | 243,080 | 47,764 | 323,606 | 285,844 | 1,204,035 |
| Lambs .. .. .. | 523,222 | 1,755,055 | 1,709,753 | 392,220 | 1,176,714 | 1,339,990 | 6,896,954 |
| Totals, 1916 .. .. | 1,841,086 | 6,007,480 | 6,032,233 | 1,363,478 | 4,769,989 | 4,773,884 | 24,788,150 |
| Totals, 1915 .. .. | 1,678,924 | 5,748,237 | 5,882,821 | 1,344,270 | 5,341,289 | 4,828,853 | 24,824,394 |

## SHEEP IN THE DOMINION: TEN YEARS, 1907–16.

| Year (30th April). | Stud and Flock Rams. | Stud Breeding-ewes. | Stud Dry Ewes. | Stud Lambs. | Total Stud Sheep and Flock Rams. | Flock Sheep. | | | | Grand Total, Stud and Flock Sheep. |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Wethers. | Breeding-ewes. | Dry Ewes. | Lambs. | |
| 1907 .. .. | 255,502 | 215,528 | 12,773 | 151,881 | 635,684 | 2,899,763 | 10,521,318 | 982,229 | 5,944,778 | 20,983,772 |
| 1908 .. .. | 272,752 | 230,075 | 14,725 | 157,556 | 675,108 | 3,378,398 | 11,013,966 | 1,152,120 | 6,229,461 | 22,449,053 |
| 1909 .. .. | 298,918 | 222,799 | 14,192 | 153,948 | 689,857 | 3,427,994 | 12,147,547 | 1,001,067 | 6,214,242 | 23,480,707 |
| 1910 .. .. | 305,569 | 227,187 | 13,943 | 160,234 | 706,933 | 3,167,082 | 12,288,193 | 1,194,570 | 6,912,842 | 24,269,620 |
| 1911 .. .. | 297,898 | 229,709 | 14,117 | 163,899 | 705,617 | 3,342,281 | 12,094,754 | 1,298,343 | 6,555,125 | 23,996,126 |
| 1912 .. .. | 306,588 | 232,782 | 11,563 | 155,498 | 706,431 | 3,359,969 | 12,044,247 | 1,324,200 | 6,315,306 | 23,750,153 |
| 1913 .. .. | 313,690 | 228,145 | 12,902 | 167,605 | 722,342 | 3,207,550 | 12,292,891 | 1,150,805 | 6,818,222 | 24,191,810 |
| 1914 .. .. | 321,869 | 229,055 | 13,526 | 170,169 | 734,619 | 3,211,661 | 12,691,121 | 1,152,749 | 7,008,613 | 24,798,763 |
| 1915 .. .. | 314,461 | 237,201 | 17,298 | 175,861 | 744,821 | 3,258,478 | 12,341,624 | 1,361,979 | 7,117,492 | 24,824,394 |
| 1916 .. .. | 316,131 | 252,201 | 15,012 | 175,155 | 758,499 | 3,478,263 | 12,640,566 | 1,189,023 | 6,721,799 | 24,788,150 |

# THE WHEAT AND OATS HARVEST, 1916.

THE following information regarding the actual results of the wheat and oats harvest of the 1915–16 season has been issued by the Government Statistician :—

## WHEAT.

From returns secured from farmers early in the season it was estimated that an area of 333,233 acres was sown or intended to be sown in wheat for threshing, whereas the actual area harvested (exclusive of a few small returns yet to be received) was 334,139 acres. Of this area 6,122 acres was utilized for chaff, hay, or ensilage, leaving 328,017 acres actually reaped for threshing.

The estimated wheat crop of the Dominion as given in the Monthly Abstract of Statistics for February, 1916, was 7,309,020 bushels, but in subsequent Abstracts the estimate was placed at approximately 7,000,000 bushels (owing to reports received as to partial failure of the crop in the southern districts). The total actual yield is now ascertained to be 7,070,814 bushels.

The actual average yield per acre for the Dominion is 21·56 bushels, as against the estimated yield of 21·89 bushels.

## OATS.

The returns collected from farmers in the early part of the season gave a total of 379,869 acres of oats sown or intended to be sown for threshing; and on the preliminary average yield (33·46 bushels), estimated in January last, the total estimated yield of oats was given as 12,722,733 bushels. From the main collection of the statistics, however, it is apparent that a great portion of the 379,869 acres returned by farmers as intended for threshing was subsequently chaffed, the returns showing that 7,489,749 bushels were threshed from 209,730 acres, the average yield per acre being 35·71 bushels. The total area of oats used for chaff, hay, or ensilage was 424,262 acres.

TABLE SHOWING ACTUAL RESULTS OF THE 1916 HARVEST OF WHEAT AND OATS FOR THRESHING.

| Land District. | Wheat (reaped for threshing). | | | Oats (reaped for threshing). | | |
|---|---|---|---|---|---|---|
| | Area. | Yield. | Average Yield per Acre. | Area. | Yield. | Average Yield per Acre. |
| | Acres. | Bushels. | Bushels. | Acres. | Bushels. | Bushels. |
| Auckland .. .. | 2,565 | 58,964 | 22·99 | 1,469 | 28,078 | 19·11 |
| Hawke's Bay .. | 1,888 | 48,340 | 25·60 | 2,983 | 113,345 | 38·00 |
| Taranaki .. .. | 1,386 | 35,630 | 25·71 | 2,079 | 68,459 | 32·93 |
| Wellington .. .. | 12,077 | 340,805 | 28·22 | 10,532 | 366,646 | 34·81 |
| Totals, North Island | 17,916 | 483,739 | 27·00 | 17,063 | 576,528 | 33·79 |
| Nelson .. .. | 1,791 | 39,222 | 21·90 | 764 | 18,870 | 24·70 |
| Marlborough .. | 5,572 | 134,417 | 24·12 | 3,697 | 48,041 | 12·99 |
| Westland .. .. | .. | .. | .. | .. | .. | .. |
| Canterbury .. .. | 244,767 | 5,086,053 | 20·78 | 73,635 | 1,937,714 | 26·32 |
| Otago .. .. | 49,214 | 1,067,635 | 21·69 | 45,745 | 1,810,646 | 39·58 |
| Southland .. .. | 8,757 | 259,748 | 29·66 | 68,826 | 3,097,950 | 45·01 |
| Totals, South Island .. | 310,101 | 6,587,075 | 21·24 | 192,667 | 6,913,221 | 35·88 |
| Dominion .. | 328,017 | 7,070,814 | 21·56 | 209,730 | 7,489,749 | 35·71 |

NOTE.—The above figures are subject to revision on account of a few returns still to come, but these are not likely to materially alter the results shown above.

# COMMERCIAL INTELLIGENCE.

## LONDON WOOL-SALES.

FOLLOWING is the High Commissioner's cabled report, dated 5th September, 1916, regarding the opening of the sixth series of London wool-sales:—

The wool-sales have commenced with a firm market and a good demand. Merinos and fine crossbreds are firm at last quotations. Medium and coarse crossbreds are ¾d. per pound higher than at closing of last sales. Prospects are favourable. The total net quantity of New Zealand wool available is 43,200 bales.

## COLLECTION OF ORCHARD-TAX.

WITH regard to the orchard-tax, particulars of which were published in last month's *Journal*, it has now been arranged with the Postal Department that the tax will be received at any money-order post-office in the Dominion. The tax is payable on 1st November, and an additional 10 per cent. will be charged on any tax unpaid at the expiration of twenty-one days after due date—namely, after 22nd November.

## LIME DEVELOPMENTS IN THE WELLINGTON DISTRICT.

THE newly formed Farmers' Mauriceville Lime Company is pushing ahead with its plans for the erection of new, up-to-date works adjoining the present kiln, which has been found inadequate to meet the demand for lime in the districts served. The new works will have a capacity of 80 tons per day and storage-bins for at least 1,000 tons. It has been ascertained that all the machinery can be procured in New Zealand.

## CALIFORNIAN CHEESE IN LONDON.

THE New Zealand Dairy-produce Inspector in London, Mr. W. Wright, reports under date 1st August, 1916, that he had the opportunity of examining a trial shipment of cheese from California, consisting of a few packages. He states—

"This cheese was apparently from two districts, one lot came from Oregon and the other from San Francisco. The cheese from the Oregon District was of fruity flavour. The body had a slight 'rubbery' feel at first, but on being worked up was found to be very weak—so weak, indeed, that it suggested a water-soaked curd. The flavour was better in the other parcel, and the cheese was slightly firmer in body, but still much too weak. The cheeses were all waxed, and had the same character as regards flavour, body, and texture as 'States' cheese, which is only suitable for quick selling because it will not keep. Trade opinion here is unfavourable to shippers, and the cheese is still unsold. California has apparently caught up with the home demand for butter, and as a result some dairymen are now turning their attention to the manufacture of cheese. It will be just as well, however, to watch developments of the trade so as to be prepared for future competition. In the case of the Californian cheese I have referred to, the type would have to be altered very materially before it could compete successfully with the New Zealand article."

*Registration of Orchards.*—It is proposed to issue shortly regulations for the registration of orchards in the Dominion, under which all persons having one or more fruit-trees growing on their holdings or premises will be required to apply for such registration. Forms of application will be obtainable from the Director of the Horticulture Division, Wellington, or any District Agent or Orchard Instructor of the Department. No charge will be made for registration.

# LONDON MARKET VALUES.

## COMPARATIVE STATEMENT COMPILED FROM THE HIGH COMMISSIONER'S CABLES FOR THE PAST THREE MONTHS.

| London Date. | Wool. Bradford Quotations for Tops. 36's. | 40's. | 44's. | 50's. | 56's. | 60's. | Mutton. Canterbury. | Mutton. North Island. | Lamb. Canterbury. | Lamb. Other than Canterbury. | Beef. New Zealand Hinds. | Beef. New Zealand Fores. | Butter. Danish. | Butter. New Zealand. | Cheese. New Zealand White. | Cheese. New Zealand Coloured. | Cheese. Canadian. | Hemp (Spot). New Zealand Good-fair. | Hemp (Spot). New Zealand Fair. | Hemp (Spot). Manila Fair (New Grade). | Hemp (Forward Shipment). New Zealand Good-fair. | Hemp (Forward Shipment). New Zealand Fair. | Hemp (Forward Shipment). Manila Fair (New Grade). | Wheat. N.Z. Short-berried. | Wheat. N.Z. Long-berried. | Oats. N.Z. Sparrowbills. | Oats. N.Z. Danish. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | d. | d. | d. | d. | d. | d. | | | | | | | | | | | | | | | |
| 1916. June 10 | .. | .. | .. | .. | .. | .. | *8⅝ | .. | *9½ | .. | 7¾ | 6¾ | 176/0 | 170/0 | 110/0 | 106/0 | 105/0 | 49/10/0 | 47/10/0 | 53/0/0 | 48/0/0 | 46/0/0 | 51/0/0 | .. | .. | .. | .. |
| ,, 18 | .. | .. | .. | .. | .. | .. | *8⅝ | .. | *9½ | .. | 8 | 7⅛ | 175/0 | 169/0 | 109/0 | 105/0 | 105/0 | 48/10/0 | 47/0/0 | 50/5/0 | 47/10/0 | 46/0/0 | 48/10/0 | .. | .. | .. | .. |
| ,, 24 | .. | .. | .. | .. | .. | .. | *8⅝ | .. | *9½ | .. | 7⅛ | 7 | 176/0 | 169/0 | 104/0 | 101/6 | 100/0 | 48/10/0 | 47/0/0 | 50/0/0 | 47/10/0 | 46/0/0 | 48/0/0 | .. | .. | .. | .. |
| July 1 | .. | .. | .. | .. | .. | .. | *8⅝ | .. | *9½ | .. | 7 | 6¾ | 176/0 | 169/0 | 99/0 | 98/0 | 96/0 | 48/10/0 | 47/0/0 | 51/0/0 | 47/10/0 | 46/0/0 | 49/0/0 | .. | .. | .. | .. |
| ,, 8 | .. | .. | .. | .. | .. | .. | *8⅝ | .. | *9½ | .. | 6 | 5½ | 173/0 | 169/0 | 96/0 | 95/0 | 93/0 | 48/10/0 | 47/0/0 | 52/0/0 | 48/0/0 | 46/0/0 | 50/10/0 | .. | .. | .. | .. |
| ,, 15 | .. | .. | .. | .. | .. | .. | *8⅝ | .. | *9½ | .. | 6 | 5½ | 172/0 | 167/0 | 85/0 | 85/0 | 86/0 | 48/10/0 | 47/0/0 | 52/0/0 | 48/0/0 | 46/0/0 | 50/10/0 | .. | .. | .. | .. |
| ,, 22 | .. | .. | .. | .. | .. | .. | *8⅝ | .. | *9⅛ | .. | .. | .. | 173/0 | 167/0 | 89/0 | 89/0 | 89/0 | 48/10/0 | 47/0/0 | 51/0/0 | 47/10/0 | 45/10/0 | 49/0/0 | .. | .. | .. | .. |
| ,, 29 | .. | .. | .. | .. | .. | .. | *8⅝ | .. | *9½ | .. | 5½ | 5⅛ | 176/0 | 169/0 | 91/0 | 88/0 | 90/0 | 48/10/0 | 47/0/0 | 51/10/0 | 47/10/0 | 45/10/0 | 49/0/0 | .. | .. | .. | .. |
| Aug. 5 | .. | .. | .. | .. | .. | .. | *8⅝ | .. | *9⅛ | .. | 5½ | 4½ | 184/0 | 174/0 | 92/6 | 93/0 | 93/0 | 49/0/0 | 47/0/0 | 51/10/0 | 48/10/0 | 46/10/0 | 51/0/0 | .. | .. | .. | .. |
| ,, 12 | .. | .. | .. | .. | .. | .. | *8⅝ | .. | *9½ | .. | 5½ | 4⅜ | 195/0 | 176/0 | 96/6 | 94/6 | 95/0 | 49/0/0 | 46/10/0 | 51/10/0 | 48/10/0 | 46/0/0 | .. | .. | .. | .. | .. |
| ,, 21 | .. | .. | .. | .. | .. | .. | *8⅝ | .. | *9½ | .. | 5⅝ | 4¼ | 198/0 | 178/0 | 97/10 | 96/0 | 96/10 | 48/10/0 | 46/10/0 | 51/10/0 | 47/10/0 | 45/10/0 | 51/0/0 | .. | .. | .. | .. |
| ,, 28 | .. | .. | .. | .. | .. | .. | *8⅝ | .. | *9½ | .. | .. | .. | 203/0 | 184/10 | 101/0 | 101/0 | 102/0 | 48/10/0 | 46/10/0 | 51/10/0 | 48/0/0 | 46/0/0 | 51/0/0 | .. | .. | .. | .. |
| Sept. 4 | .. | .. | .. | .. | .. | .. | *8⅝ | .. | *9½ | .. | .. | .. | 197/0 | 186/10 | 103/0 | 103/0 | 103/10 | 49/10/0 | 47/10/0 | 52/0/0 | 49/0/0 | 47/0/0 | 51/0/0 | .. | .. | .. | .. |
| ,, 11 | .. | .. | .. | .. | .. | .. | *8⅝ | .. | *9½ | .. | .. | .. | 196/0 | 186/10 | 104/0 | 104/0 | .. | 49/10/0 | 47/10/0 | 51/10/0 | 48/10/0 | 48/10/0 | 50/10/0 | .. | .. | .. | .. |

* Specified as "New Zealand."

NOTE.—All the above beef quotations are specified as "N.Z. bull-beef." In cable of 5th August "N.Z. cow-beef" was quoted—hinds, $5\frac{5}{16}$d.; fores, $4\frac{1}{2}$d.

# NEW ZEALAND EXPORTS TO BRITAIN.

COMPILED FROM MANIFESTS OF VESSELS SAILED DURING RESPECTIVE MONTHS OF CURRENT AND PRECEDING SEASONS.

| Month. | | Mutton, Carcases. | Lamb, Carcases. | Beef, Quarters. | Pork, Carcases. | Butter, Boxes. | Cheese, Crates. | Wool, Bales. | Wheat, Sacks. | Oats, Sacks. | Rabbits, Crates. | Hemp, Bales. | Tow, Bales. | Kauri-gum, Pkgs. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| January, | 1916 | 166,700 | 295,170 | 41,726 | 179 | 108,593 | 101,917 | 92,849 | .. | .. | .. | 7,438 | 1,666 | 1,218 |
| ,, | *1915* | *137,816* | *296,439* | *45,622* | *339* | *138,081* | *85,123* | *87,393* | .. | .. | *2,860* | *683* | .. | *1,209* |
| February, | 1916 | 170,973 | 266,414 | 29,056 | 23 | 96,096 | 84,740 | 96,016 | .. | .. | .. | 8,161 | 1,804 | 1,900 |
| ,, | *1915* | *433,585* | *517,581* | *77,421* | *311* | *119,371* | *96,090* | *159,347* | .. | .. | .. | *13,111* | *6,619* | *2,763* |
| March, | 1916 | 327,977 | 363,269 | 83,725 | .. | 59,671 | 62,082 | 49,750 | .. | .. | 474 | 2,666 | 637 | 1,247 |
| ,, | *1915* | *80,439* | *203,480* | *30,176* | .. | *55,280* | *51,811* | *49,809* | .. | .. | .. | *8,410* | *185* | *274* |
| April, | 1916 | 108,488 | 195,707 | 106,369 | .. | 24,703 | 81,652 | 41,725 | .. | .. | .. | 3,782 | 337 | 450 |
| ,, | *1915* | *286,155* | *328,779* | *45,340* | .. | *6,703* | *38,561* | *41,371* | .. | .. | *1,011* | *9,328* | *1,474* | *3,461* |
| May, | 1916 | 170,164 | 282,156 | 134,971 | .. | 26,789 | 56,961 | 26,356 | .. | .. | 1,000 | 2,892 | 235 | 731 |
| ,, | *1915* | *257,953* | *433,831* | *34,780* | *655* | *148* | *17,065* | *21,615* | .. | .. | *2,923* | *4,968* | *808* | *2,636* |
| June, | 1916 | 138,303 | 290,319 | 41,593 | .. | 10,289 | 18,463 | 22,998 | .. | .. | 5,439 | 5,260 | 2,076 | 1,219 |
| ,, | *1915* | *99,080* | *154,785* | *19,316* | *932* | .. | *26,869* | *11,946* | .. | .. | *9,800* | *5,027* | *1,320* | *1,229* |
| July, | 1916 | 367,827 | 593,670 | 42,322 | .. | 4,209 | 30,940 | 50,804 | .. | .. | 10,950 | 9,244 | 3,720 | 3,230 |
| ,, | *1915* | *243,420* | *340,476* | *21,231* | *154* | .. | *21,520* | *16,039* | .. | .. | *5,968* | *5,068* | *1,639* | *4,184* |
| August, | 1916 | 238,926 | 266,390 | 76,755 | .. | 9,810 | 32,178 | 18,713 | 3 | .. | 9,725 | 7,463 | 1,868 | 3,293 |
| ,, | *1915* | *510,418* | *570,381* | *51,750* | *35* | .. | *18,287* | *19,416* | .. | .. | *31,790* | *7,138* | *1,466* | *4,848* |
| September, | 1915 | 299,715 | 330,643 | 59,487 | .. | 26,416 | 2,595 | 5,360 | .. | .. | 7,750 | 2,022 | 3,091 | 595 |
| ,, | *1914* | *53,380* | *49,200* | *2,353* | .. | *15,885* | .. | *3,337* | .. | *5,896* | *7,288* | *1,143* | *57* | .. |
| October, | 1915 | 367,198 | 417,794 | 87,104 | .. | 111,468 | 49,160 | 7,272 | .. | .. | 56,636 | 5,650 | 1,645 | 1,230 |
| ,, | *1914* | *291,432* | *128,016* | *49,104* | .. | *81,842* | *30,487* | *8,938* | .. | *68,660* | *38,121* | *2,042* | *1,650* | *1,683* |
| November, | 1915 | 93,777 | 92,601 | 21,609 | .. | 81,102 | 47,243 | 18,715 | .. | .. | 13,538 | 5,064 | 1,789 | 868 |
| ,, | *1914* | *136,346* | *27,577* | *48,302* | *27* | *98,729* | *70,048* | *37,604* | *15* | *24,289* | *35 783* | *885* | *110* | *1,377* |
| December, | 1915 | 91,124 | 59,231 | 36,467 | .. | 214,967 | 81,939 | 33,527 | .. | .. | 3,052 | 6,016 | 1,940 | 5,555 |
| ,, | *1914* | *192,952* | *149,835* | *44,876* | .. | *172,990* | *80,144* | *86,317* | .. | .. | *9,306* | *1,136* | *116* | *2,157* |

## STOCK EXPORTED.

THE following table shows the numbers and descriptions of stock exported from the Dominion during the month of August, 1916:—

| Port of Shipment. | Horses. | | Sheep. | | | Cattle. | | Pigs. |
|---|---|---|---|---|---|---|---|---|
| | To Australia. | To Eastern Pacific. | To Australia. | To Eastern Pacific. | To San Francisco. | To Australia. | To Eastern Pacific. | To Eastern Pacific. |
| Auckland .. | .. | 3 | .. | 188 | .. | .. | 34 | 65 |
| Gisborne .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Napier .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Wellington .. | 10 | .. | 2 | .. | .. | .. | .. | .. |
| Lyttelton .. | 5 | .. | 457 | .. | 100 | .. | .. | .. |
| Dunedin .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Bluff .. | 1 | .. | .. | .. | .. | .. | .. | .. |
| Totals .. | 16 | 3 | 459 | 188 | 100 | .. | 34 | 65 |

The following are particulars of horses shipped: Trotting, 1 mare, 2 geldings, 1 stallion, 1 horse; 1 hack mare; thoroughbred, 6 mares, 3 geldings, 1 stallion; 1 pony gelding; 3 medium-draught geldings.

## STOCK IN QUARANTINE.

THE following stock was received into quarantine during the month of August, 1916:—

| No. | Description. | Sex. | Port of Origin. | Owner or Agent. | Address. |
|---|---|---|---|---|---|
| | MOTUIHI ISLAND (AUCKLAND). | | | | |
| | Nil. | | | | |
| | SOMES ISLAND (WELLINGTON). | | | | |
| 2 | Collie dogs .. | Male .. | London .. | J. Harvey .. | Nelson. |
| 1 | Irish terrier dog | ,, .. | Egypt .. | Major A. M. Samuels | Lower Hutt. |
| 3 | Aberdeen Angus cattle | Female | London .. | Burling Bros. .. | Pongaroa. |
| 1 | Ditto.. .. | Male .. | ,, .. | ,, .. | ,, |
| 1 | ,, | ,, .. | ,, .. | F. Armstrong .. | Akitio. |
| | QUAIL ISLAND (LYTTELTON). | | | | |
| 2 | Collie dogs .. | Female | London .. | James Lilico .. | Lochiel. |
| 7 | Collie pups .. | Male .. | ,, .. | ,, .. | ,, |
| 6 | ,, .. | Female | ,, .. | ,, .. | ,, |
| 1 | West Highland terrier dog | Male .. | ,, .. | Mr. McDougall .. | Christchurch. |

*An Akaroa Homestead.*